The FOUNDRY

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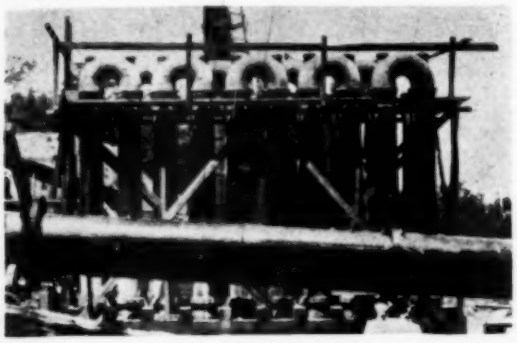
Castings Resist Corrosion in Mercury Condenser

MERCURY or quicksilver as it popularly is known, has many industrial uses including its recent application in the transformation of heat into electric power. Mercury is found in nature as a combination of mercury with sulphur in the ore called cinnabar. In its recovery the ore is crushed, and then roasted in oil-fired rotary kilns. The gases are drawn through a dust precipitator, and then into the condenser. Water vapor is added and that operation tends toward the formation of sulphurous, and later, sulphuric acid. The mercury condenses and flows into a trough while the gases are exhausted into the air. Previous to the application of cast iron pipe and return elbows as the condensing system, brick, stone, vitrified tile, steel pipe and monel metal were used. Substitution of cast iron pipe and elbows for other materials apparently has eliminated much of the trouble encountered as one installation has operated continuously for six months without any visible corrosion, and another three months. The radiation coefficient compares favorably with steel or sheet metal units.



Courtesy H. W. Gould & Co., San Francisco

Cast Iron Pipe and Return Elbows Resist Action of Sulphur Gases in Liquefying Mercury Vapor

Find Where Castings Can Be Sold

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Canadian Railroad Builds New Foundry

Fig. 1—The General Superintendent of Motive Power, J. C. Garden, Poured the First Casting in the New Foundry

THE new gray iron foundry at the Point St. Charles, Montreal plant of the Canadian National Railways is the fourth unit to be completed under a rehabilitation and modernization program. All the old repair plants at this point, locomotive and car shops, gray iron foundry, stores, etc., have been replaced by modern construction and equipment.

One building 165 x 265 feet houses the foundry 165 x 205 and the 3-story pattern shop 60 x 165 at the south end. The two upper stories are for storage.

The foundry is divided into three longitudinal bays, the center bay 65 feet and the east and west bays each 50 feet wide. The clearance height from the floor to the bottom chord of the roof truss is 40 feet. The west bay is served by a 5-ton charging crane made by the Whiting Corp., Harvey, Ill., the center bay by two electric overhead traveling cranes, one of 15 tons and one of 5 tons capacity, made by the Dominion Bridge Co., Montreal, and the east bay by one 5-ton electric overhead traveling crane also built by the Dominion Bridge Co. Four jib cranes at convenient locations are equipped with electric hoists, and a monorail for distributing molten metal extends along the east wall. The foundry floor is reinforced concrete with smooth metallic surface.

Bins for the storage of coke, pig iron, scrap cast iron, scrap steel, limestone, clay and molding sand occupy the greater part of the west bay. Storage of these materials inside the building is a distinct advantage especially in the winter months. The charging crane transfers the materials from the railway cars to the bins, the metals with a magnet and other materials by a single line clam shell bucket. This five-motor crane is equipped with one 5-ton standard hoist and one 3-ton charging hoist.

Bins for all materials other than sand are so constructed that their contents gravitate to

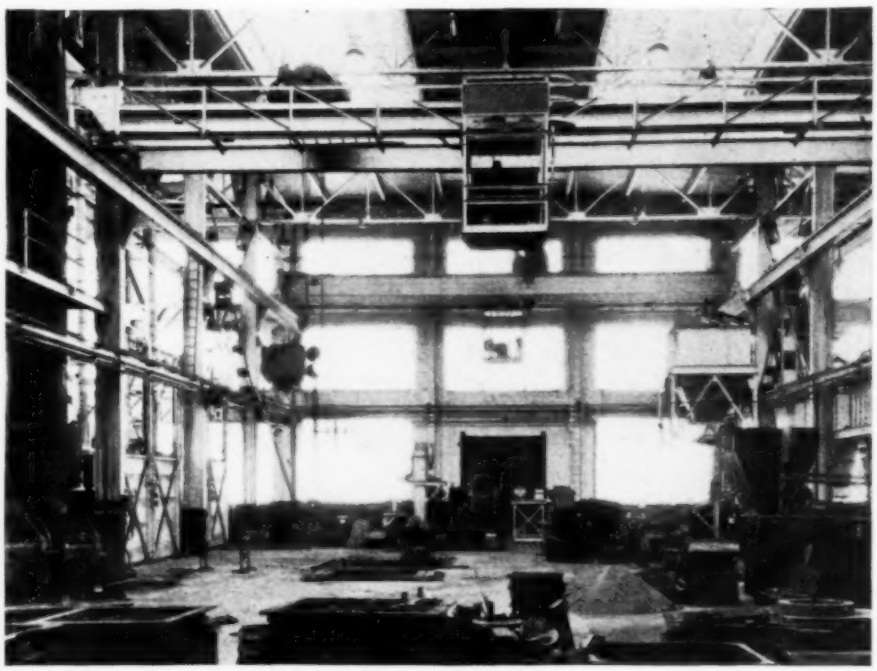


Fig. 2—General View of the Main Bay Looking Toward the North

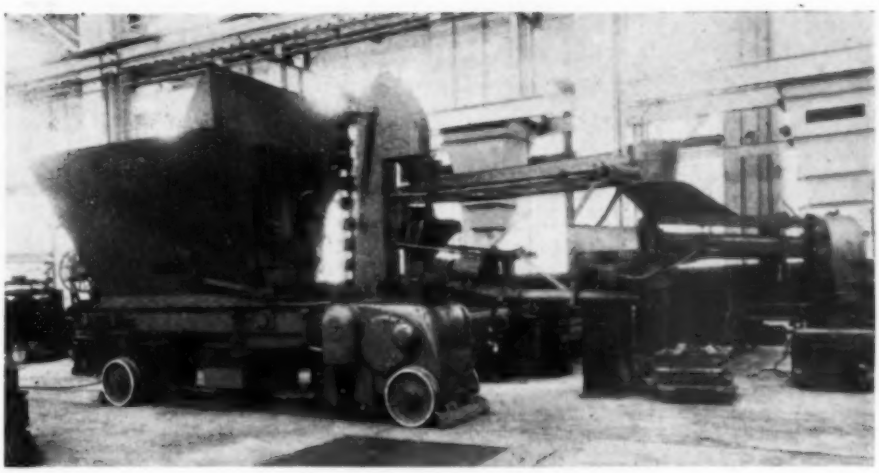


Fig. 4 — A Hopper Type Sand Slinging Machine Mounted on a Track Serves Several Molding Machines or May Be Utilized to Ram the Sand in Flasks Set Down within Reach of the Arm

a rake-out platform along the front of the bins. Under the lip of this rake-out platform a six beam charging scale travels the full length of the platform on a 30-inch industrial track. The charging buckets are placed on the scale and can be loaded from the rake-out with a minimum amount of labor. Then they are set aside on roller conveyors to be picked up by the charging crane.

Sand bins are equipped with discharging gates in the bottom from which the sand is drawn off into skid hoppers handled by motor lift trucks.

Metal is melted in either of two cupolas made by Whiting Corp., Harvey, Ill., each 72 inches in diameter, 70 feet high, one brick lined to 54 inches diameter and the other to 42 inches. Both are equipped for mechanical charging. The centrifugal blower has a maximum capacity of 6200 cubic feet of air per minute when running at 3500 revolutions per minute and a maximum delivery pressure of 24 ounces. Air from outside is received through a duct under the floor.

A small cylinder for feeding nickel shot or other alloy metals to the iron before it reaches the ladle is mounted above each spout. The rated capacity of one cupola is 6 and the other 12 tons per hour.

Heavy castings are poured in the center bay shown in the illustration Fig. 2. Doors of the mold and core ovens may be seen in this illustration just beyond the cupolas. Equipment in this bay includes the dry sand conditioning plant,, the green sand conditioning plant, the sand slinging machine, etc.

The core ovens electrically heated and equipped with automatic control are in four sections, each 10 feet, 6 inches wide, 17 feet deep, 9 feet 9 inches high. In each section two cars running on standard gage track are fitted with sectional steel racks so designed that they can be lifted in sections as required by the overhead cranes.

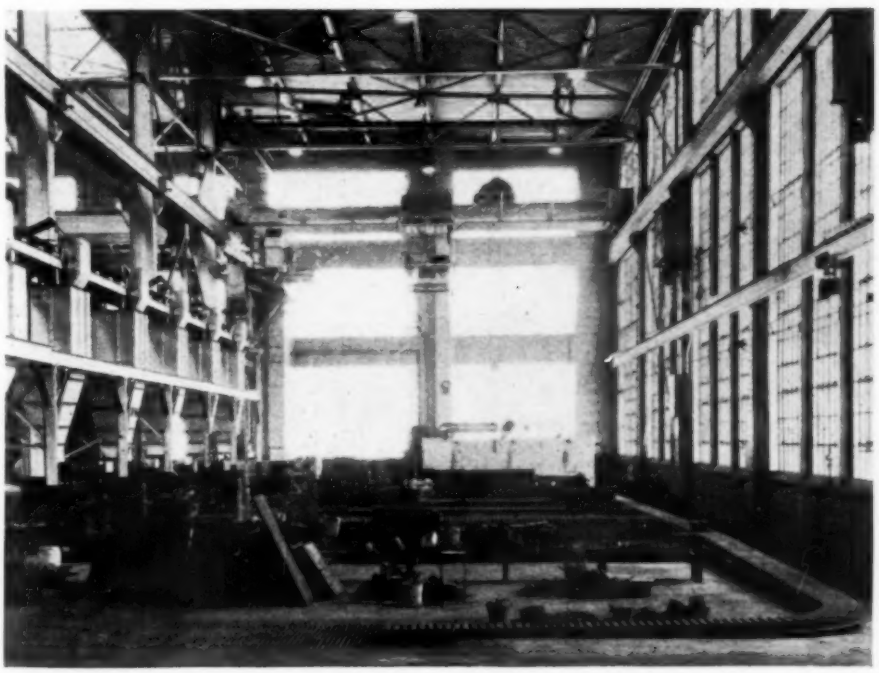


Fig. 3—The East Bay is Provided with Conveyors for the Molds and a Monorail

The green sand handling equipment begins to function at three shakeout hoppers, one in the east bay and two in the center bay located below floor level and covered by substantial gratings.

Used sand is delivered by apron conveyors to a belt conveyor beneath the floor. The belt conveyor delivers it to the conditioning plant at the north end of the center bay. Here the sand is freed from core irons, nails, etc., screened, revivified and finally elevated to an overhead belt conveyor which runs along the west side of the east bay. From this overhead belt conveyor the reconditioned sand is ploughed off as required into a series of eight hoppers. One

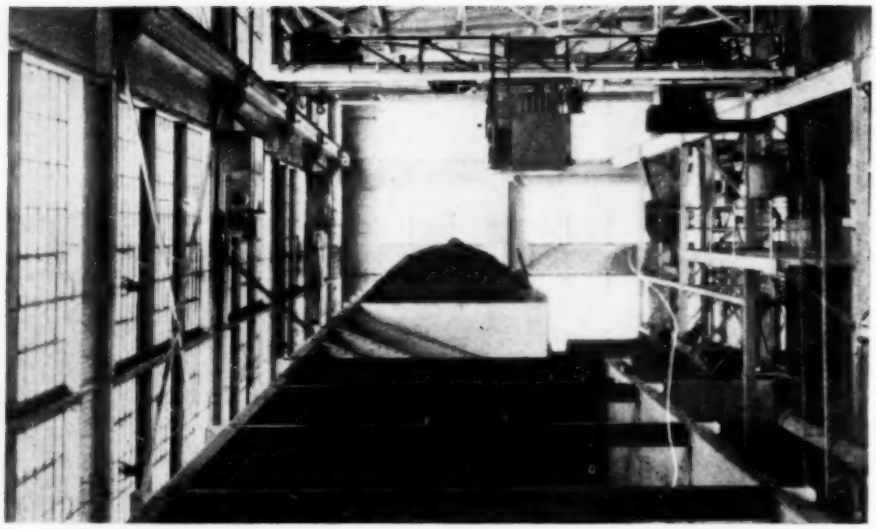


Fig. 5—Coke, Sand and Other Materials Are Stored in a Series of Bins

feeds the sand slinging machine. Six others discharge directly over the molding machines which serve the east bay, and the eighth takes the spill-over, at the end of the conveyor. From here the sand can be taken by skid hopper and lift truck to various points for ordinary floor molding.

Dry sand molding is concentrated as far as possible in the northwest corner of the center bay near the ovens. For this reason the dry sand conditioning plant is not so elaborate as the green sand plant. The sand is reconditioned just as completely, but as only one shakeout and one delivery point are required, the apparatus occupies a comparatively small area.

The sand slinging machine made by Beardsley & Piper Co., Chicago, travels nearly the whole length of the east side of the center bay on a 36-inch gage track. It carries 12 tons of sand and is operated by push button controls on the operating head.

One end of the east bay, where the lighter green sand castings are made, is shown in Fig. 3. Six molding machines operate along the west side of this bay. Hoppers for the storage of prepared sand are mounted directly over the machines. The molds are placed on roller conveyors leading directly across the bay to the pouring line. The monorail from which the ladle is suspended extends along the east wall of the bay and all molds are poured on the roller conveyor directly beneath it.

Iron is brought from the cupola in lift truck ladles. The poured molds gravitate to the shakeout shown in the foreground, Fig. 3. A battery of three electrically heated core ovens in which all the smaller cores are baked may be noted at the far end of the bay in that illustration.

Fig. 7—The Pattern Shop Is Located on the Ground Floor of a Three Story Building with a Wash and Locker Room on the Second Floor and a Pattern Storage Room on the Top Floor

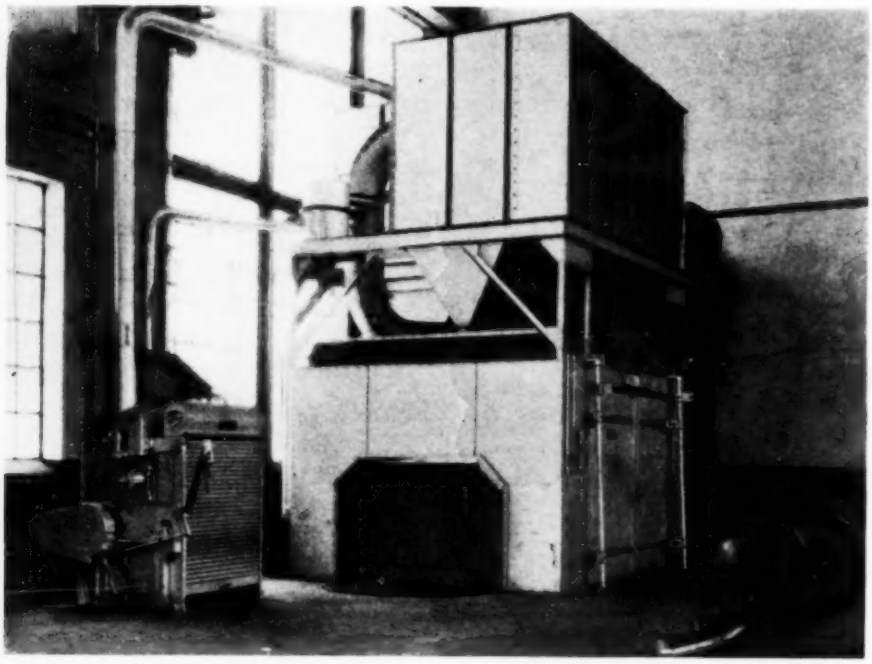


Fig. 6—Castings Are Cleaned in a Small and a Large Sandblast Unit Installed in a Room Set Apart for the Purpose

The shakeout in the east bay is located conveniently close to the cleaning floor area equipped with sandblast apparatus made by Pangborn Corp., Hagerstown, Md. The sandblast room 15 feet long, 12 feet 6 inches wide, 9 feet high inside dimensions, admits a 10-ton car on standard gage track for handling the heavy castings. A turntable in the floor 8 feet in diameter handles castings of moderate weight. Small castings are cleaned in a sandblast barrel with a drum 30 inches in diameter and 40 inches in length. Angular steel grit is used in the sandblast nozzles of all cleaning apparatus.

Served by Elevator

The pattern shop is separated from the foundry by a hollow tile wall and fireproof doors. It is equipped with a sprinkler system for fire protection and the same protection is extended to the two pattern storage

floors above the shop. The pattern storage floors are served by a stairway and also by a 5-ton freight elevator with pushbutton control.

Pattern shop mechanical equipment includes a universal wood miller, a cross-cutting and trenching machine and the necessary complement of lathes, circular saws, band saws, sanders, etc. The shop is equipped with the usual shaving exhaust system and the floor is constructed of creosoted wood blocks. The second story of the pattern shop contains the wash, toilet and locker rooms.

The interior surface of walls and roof, also all steel superstructure is coated with aluminum paint down to within 5 feet of the floor level. The remaining 5 feet is finished in black. This arrangement greatly assists in the uniform diffusion of light throughout the shop.

Ventilation is taken care of by seven 84-inch and twelve 18-inch ventilators in the roof the center bay, seven 48-inch ventilators in the roof of the east bay and four 48-inch and two 60-inch ventilators in the roof of the west bay.

Eight unit heaters on the outside walls are so arranged that the air supply can be taken from the outside or the inside of the building. Eleven unit heaters of smaller capacity are used to heat the pattern shop and pattern storage floors.

The outside walls are concrete to the first row of windows 3 feet above floor level. From this point up, the walls are of red brick with reinforced concrete bands above each row of steel window sash. All roof drainage is carried down inside the building to storm sewers.

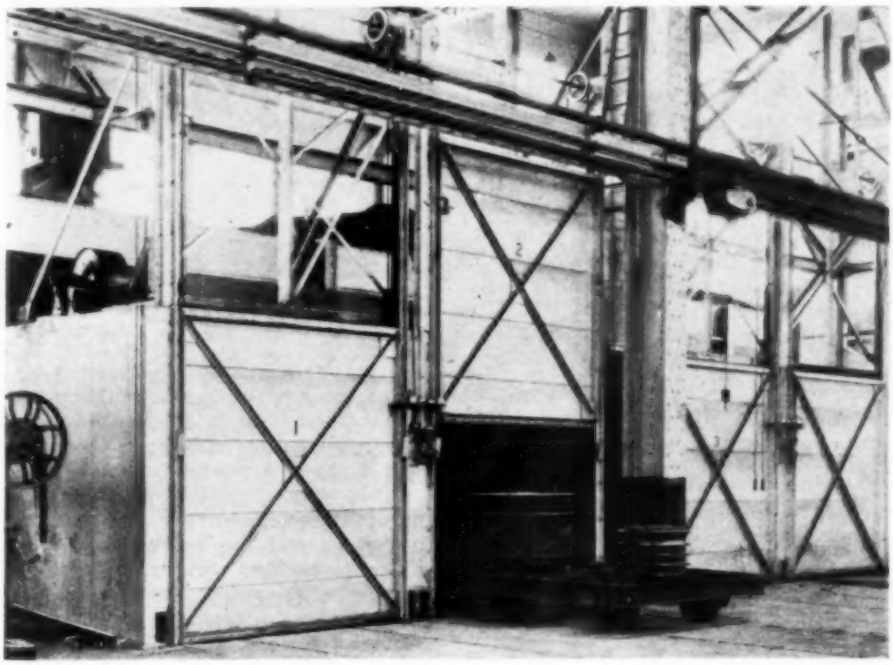


Fig. 8—The Core and Mold Drying Ovens Are Heated Electrically and Are Under Automatic Control

Ohio Safety Campaign Shows Progress

Launched Nov. 1, the All-Ohio foundry safety campaign is showing excellent progress, according to Robert Hoierman, secretary of the Ohio Foundries association, which is sponsoring the drive. Sixty-one of the 180 foundries taking an active part in the campaign, reported 29 minor accidents for November. These plants employed a total of 8284 foundry workmen with a total of 694,164 man hours. Twelve of the accidents resulted in less than 7 days disability each while 17 were over 7 days.

Figures compiled by the Ohio Industrial commission at Columbus, O., for November show a total of 291 foundry mishaps in the state with one fatality. The death occurred in a steel plant. Gray iron foundries head the list with a total of 163 or more than half of the accident claims filed by foundry employes in the state. Nonferrous foundries were second with 43 claims, steel third with 41, malleable iron fourth with 38 and cast iron pipe fifth with six. Time lost by injured workmen totaled 7739 days or the equivalent of more than 21 years. However, the greatest part of the lost time was due to the one fatality.

In state records, 6000 lost days were charged against the foundry industry for the one fatality, leaving only 1739 lost days for the other 290 accidents. The lone fatality, caused by using hand tools, cost the foundry industry more than three times the total lost time of the other 290 mishaps. That most of the accident victims required only minor first aid treatment is indicated in the report showing 214 accidents with a total of 83 days lost time. The best report filed for November with the association shows 582 employes working 66,054 hours without a single accident.

The Ohio Foundries association is sponsoring the campaign in an effort to reduce the number and severity of accidents and secure a lower state insurance rate. A. H. Kramer, Advance Foundry, Dayton, president of the association is general chairman, J. W. Beall, insurance commissioner for the Ohio Steel Foundry Co., Lima, O., assistant general chairman and Robert Hoierman, Cleveland, secretary of the association, managing director of the safety campaign.

Book Review

The Abolition of Poverty, by Harrison E. Fryberger, cloth, 152 pages, 5 x 8 inches, published by Advance Publishing Co., New York City and supplied by THE FOUNDRY, Cleveland for $1.50 plus postage, and in London by the Penton Publishing Co., Ltd., 416-17, Caxton House, Westminster.

The title of this publication indicates an ambitious aspiration no doubt possessed by all normal thinking people. However, the reader is not convinced that the methods of attaining this goal are assured by the enthusiastic writer. He pays his compliments to the boom era and asserts that the problem of securing wealth is solved with the future assured through immense natural resources. The ills represented by speculation, control of large industries and fortunes by coteries even where stock is widely held, and the abuse of management typified by huge bonus payments to corporation heads is attacked.

The writer is restrained in his treatment of the capitalistic system, decries the Russian destructive social and industrial plan and believes that a correction of existing evils in the American method of producing and distributing wealth will abolish poverty. He suggests regulating mergers, abolishing chain store distributing, curbing the compensations paid to officers and executives of corporations, increasing income taxes in the upper brackets and the disintegration of large fortunes through stringent estate taxes which will leave only a modicum residual balance to the heirs.

Department of commerce commercial standard on foundry patterns of wood has been reaffirmed for another year, without change, beginning Feb. 2, 1932.

Make Early Steel History In Milwaukee

By Charles Vickers

Charles Vickers

ONE of the pioneers of the steel casting industry in the United States of whom little is known and to whom less credit is given was Solomon (Sol) Shaw, an employe of the A. P. Allis Co., Milwaukee. Sol with his brother Ab, and other members of the family left Staffordshire, England, in the early eighties. They finally settled in Mil-

Sol Shaw

waukee, where the boys got jobs in the iron foundry of the A. P. Allis Co. located on Clinton street adjacent to the tracks of the Chicago, Milwaukee & St. Paul railway. They were ambitious, hard and dependable workers and had no objection to pounding sand into molds for boiler section castings used for heating purposes. The work was hard, with no variety but somebody had to do it. The Shaws were elected. The job was piece work and paid well, once the little trick of making good castings was mastered. Perhaps the term knack is more elite, but the foundryman refers to it as a trick.

Many molders never did master the trick and the labor turnover was high. The job was despised anyhow. Those who worked at it were looked down on as outside the pale of good molders' society. This was in the reign of the Brotherhood of Machinery Molders, the Red Card men, who esteemed themselves far above such menial labor as molding boilers. They had that lofty feeling of contempt that goes with class, for those misguided ones who were satisfied with such work.

The Shaws did not seem to mind and in due time the expansion of the engineering part of the Allis business raised the problem of what to do with the boiler sections. There was no room for them in the up-town foundry, the only one the company had at that time.

Was Appointed Foreman

Another foundry was built, a temporary affair that became a permanency, and the South foundry as it was called, came into being. It was built of wood, was spacious, painted red and was situated on made land on the banks of Kinnickinnic creek, adjacent to Kinnickinnic avenue, a continuation of Clinton street, Milwaukee. Sol Shaw, as a reward for his industry, came into his own. He was appointed foreman or superintendent of the new South foundry, and his brother Ab was made straw boss of the boiler section department, but still put up his regular assignment of molds per day.

In spite of the relief afforded by the new foundry, Joe Harrison, manager of the up-town foundry soon found himself again swamped with work. Those were days of expansion for the Allis Co. Patterns for machinery castings had to follow the boilers to the South foundry, although probably at first with many misgivings. Sol was equal to the occasion, and in a short time the South foundry became an important unit of the Allis plant.

However, Shaw was not satisfied. He longed for new worlds to conquer. He wanted to operate a brass foundry. Finally he got the sanction of those in high quarters and started in a separate rectangular wooden building located in the front yard of the iron foundry. Old Mr. Mellon, who had acquired riches by his monopoly of making the Allis brass castings, lost, one sad day, his most important customer, and his best molder, a young fellow he had trained himself, who now was appointed foreman of the new venture by Sol Shaw. The years have passed since then, and this young fellow no longer is young, but he is still the head of the brass foundry of the Allis Chalmers Co., now at West Allis, Wis. Everybody in the Middle West knows George Klenk, the one time young fellow who took charge of the brass foundry so long ago, and under whose able management this brass foundry venture of Sol Shaw, now gathered to his rest, proved such a success.

Wanted to Make Steel

The next ambition of Sol was to make steel castings. Steel castings were rare objects in those days, and there was much doubt as to whether such castings could be made. Probably the company considered the venture too much of an experiment. Sol, not to be beaten, started his experimental work in the basement of his home.

At that period, around 1890, just before the Chicago World's fair, Shaw had a nice home situated on the brow of a hill on a street known as South Bay street, Bay View, a section of Milwaukee, and overlooking the South foundry in the valley below. He fitted up the basement of this home as a little foundry where for several years he and his sons

experimented with various foundry problems. At the time of which we write, steel seemed to be the metal that engaged their attention. Finally a building was erected on the rear end of the lot, the better to work out the problem before them.

What probably led Shaw to think of making steel castings was the fact that the J. A. & P. E. Dutcher Co., were in the steel casting business. They had attained enough success to get into production with a rough class of castings that were accepted as being as good as could be obtained in that metal. The Dutcher plant formerly had been a stove foundry. Just what led the firm to attempt the casting of steel or wrought iron, as some regarded it, is unknown to the present writer. Possibly after reading this, someone will arise with data and push the early history of cast steel, still further back into the shadows of the past.

Melt Wrought Iron

However, at this time considerable talk was floating around the foundry world concerning the making of *mitis* castings, which were supposed to be wrought iron castings made possible by the addition of aluminum. It was supposed that wrought iron could not be melted, but only could be brought to a mushy state, but if, when in this state, a small amount of aluminum was added, the iron immediately liquified, and could be poured into sand molds to make what were known as *mitis* castings, of the possibilities of which all sorts of strange stories were told. So far as my memory serves the process originated in Norway or Sweden where a special type of oil burning furnace was devised for melting the iron. This furnace, known as the Nobel furnace, is illustrated in Fig. 1.

The Dutchers had installed several of these furnaces so it is likely that they picked up the idea from abroad and engaged people familiar with the foreign practice to install the process and furnaces in their plant. The furnace was a natural draft oil-fired furnace in which the oil was burned in a series of pans, usually three high. The top and middle pans were fitted with two overflow holes, built up so that the oil would pass down through the holes to the lower pan at a certain level that did not permit the overflowing of the sides of the pan. The bottom pan contained no holes and the flow of oil was so adjusted that the burning oil was kept at a constant level in the pans. The flame was drawn down by the draft of a tall chimney into the first melting chamber entering at the bottom, thence up and around the crucible into the second chamber which it entered by ports at the top, to swirl down and into the third chamber by ports at the bottom, from which a top port led to the chimney.

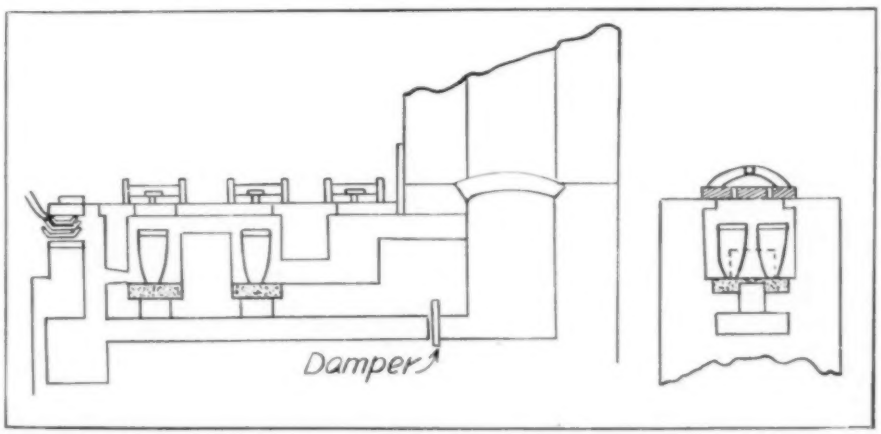


Fig. 1—The Nobel Furnace Contained Three Melting Chambers

Advance the Pots

The first chamber was the melting hole, the second for preheating only and the third would not melt steel, although it could be used for brass. When the first pots were pulled, those in the second chamber were advanced to the first chamber, and cold pots put in their place. While the pots were being pulled and the chambers recharged, the flame was by-passed to the chimney by the bottom flue. The intake of air was regulated by opening or closing a slot above the burners, by sliding a flat piece of steel on or off.

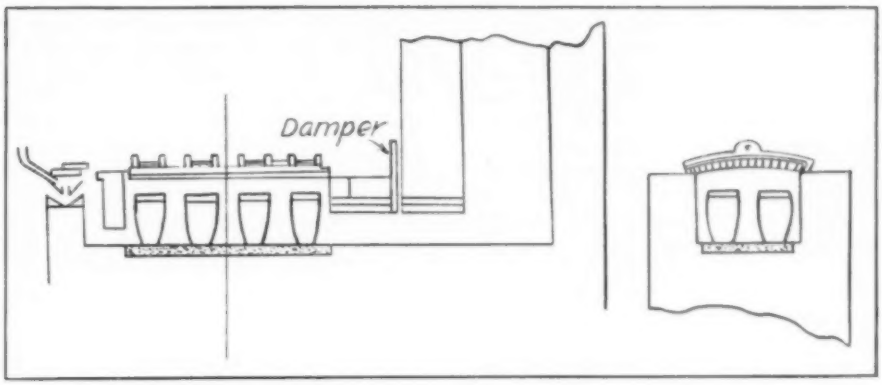


Fig. 2—Later Furnaces Contained Only One Melting Chamber

These furnaces were expensive to operate. The bridge walls were cut away rapidly by the flame, so that if one furnace had ample melting capacity, it would be necessary to install two, as one furnace would be down about half the time undergoing repairs. Each furnace was 9 feet long, 5 feet wide and 5 to 6 feet high and was sunk in the ground until the top was 12 to 18 inches above the floor. They were equipped with pits to permit cleaning the flues, and recovering spilled metal.

The bottom of each melting chamber was covered with a couple of inches of coke dust. The bottom itself was a cast iron plate with two holes underneath the crucibles. Each hole was covered with an old crucible bottom.

When a crucible broke the melter was supposed to drive a heavy steel bar down through the hole breaking the crucible bottom and releasing the liquid steel to drain through the hole and through an aperture in the brickwork into the by-pass flue, from whence it could be fished out in the morning. Steel is not so tractable. A few dribblings might get down the hole, but the greater part remained in the melting chamber as an irregularly-shaped pancake with roots or fingers sunk into the brickwork of the bridge walls, which had to be torn down and rebuilt. The oil consumption was around 280 gallons per ton of steel melted. These were the furnaces the Dutchers installed and were the furnaces that Shaw, later on, installed. In time, as the steel business grew in Milwaukee, this was the type of furnace that everybody used.

Simplify the Furnace

Eventually the idea struck some person, whose name history has not preserved, that the Nobel furnace could be greatly simplified. He built the furnace shown in Fig. 2, which later became known as the Milwaukee furnace. This furnace was nothing but a narrow rectangular hole in the ground, with pan burners at one end and a high chimney at the other. The flame was by-passed by simply shutting off the

oil supply. The bridge walls did not exist. Six crucibles were charged at one time and were moved forward in succession as the front ones were removed with their molten charge, and freshly charged ones placed in the rear. This furnace worked better than the original model and saved about 50 gallons of oil per ton of steel melted.

The molding material used at that time was ground firebrick mixed with ground crucibles in the Dutcher plant; ordinary sand was used for backing. A certain portion of the foundry was walled off, and locked off, for a holy of holies. In there, was stored all the material used in the production of castings, and the steel mixtures were weighed. Any employe, with the exception of the lord's anointed, who might wander into this sacred precinct was immediately *bounced*. Some one some time in all such cases is sure to leave the door unlocked. Early castings were rough and beautifully pock-marked, but at that time that was supposed to be the nature of the beast.

Some Secrets Leaked Out

As always happens in like cases, some few *secrets* leaked out, although not enough to be materially helpful to Shaw; who certainly was having his troubles to the infinite amusement of the Dutcher outfit, rank and file upward. Shaw had learned about the ground firebrick and the plumbago crucibles and fireclay mixture and imitated it. Also he knew that some white wash was used on the molds but he could not get the name. Worse than that, just what they put into the steel to make it sound, was hidden from view. Of course, he knew what kind of stock was melted. That came in railroad cars, and could be seen by anybody interested. It was boiler punchings chiefly.

The World's Fair had become a memory. Chicago was lying there, flattened and exhausted, and the panic of '93 and following years was with us, when Sol Shaw got the idea that if he was to make any progress with his steel foundry he would have to get some more skilled help. He pursuaded the writer, then molding at Hoffman-Billings brass foundry, Milwaukee, to leave there and "take charge" of the steel foundry on the hill which had never yet made a steel casting. The adventure in the proposition appealed. There was not much money in it. The writer knew nothing about steel, but neither did any one else, for that matter, know very much about it, at least in Milwaukee.

A certain amount of progress had been made in the little shop under the direction of Shaw's eldest son, Louis, a patternmaker. A coke-fired natural draft furnace was attached to a 45-foot high brick stack. In addition we had lots of coke, wood and matches, some No. 60 steel melting crucibles; a good-sized core or mold oven, molding sand such as was used for heavy cast iron, core sand, core plates, flasks of various kinds, bottom boards and some bottom plates. A brassmolder's tub partly filled with pounded firebrick and old crucibles, and a lot of other equipment without which no first class, regular steel foundry could be put into operation.

Melter Is Treasure

Mention of the greatest treasure is reserved to the last; a Hungarian furnace tender, with a smiling half cynical expression, and a flow of broken English charming to hear, who taught the writer how to melt steel in a natural draft, coke fired, crucible-pit furnace, sometimes familiarly known as a coke hole.

It did not take a brass molder long to discover that ground firebrick and ground crucibles mixed with fireclay made a poor mold, and an equally poor looking casting. Evidently the leading problem was to discover a more suitable material. The castings we were working on—and how we worked—were ammonia valves. Every one was consistently bad, due largely to the rough, pock-marked surfaces, to leaks caused by checks and small cracks, and to porosity.

To discover what caused the rough surfaces, a number of open molds were made, each faced with a different material. One was faced with the ground fire-brick, ground crucible mixture, thought so essential by the steel casters of that day. A second was faced with facing sand from the South foundry that had been made up for an iron casting weighing between 30 and 40 tons. A third was faced with silica sand, that had been bought for cores. This was mixed with fireclay, and the mold was backed with iron molding sand. There were several others of no importance as far as the advancement of steel casting was concerned.

As each mold was poured, the action of the steel as it came into contact with the facing was carefully scrutinized by the writer. All the molds were dried, and no particular sharpness was needed to note the superiority of the silica facing. A new steel facing sand was formulated, consisting of silica sand, clay, flour, and a certain proportion of new molding sand, and permission was secured to use it in place of the other materials. Every one was hopeful that the molding sand problem was in a fair way to solution. Most of the castings were small. While the facing sometimes burnt on due to the molding sand content, the facing as a rule gave very good results.

However, Dutcher's white coating still was a mystery. We must have that. The public library became a haunted place in the evenings, but no reference to silica flour could be found. The writer was on friendly terms with the pharmacist at Drake Brothers Reed street drug store. He suggested a trial of tripoli, a polishing powder thought by some to be calcareous in origin, but which is almost pure silica. Analysis shows 98 per cent silica, the remainder being largely ignition loss and fractional percentages of alumina, iron and the alkalies. It was the same thing Dutchers were using although probably bought under a different name.

The tripoli flour was just the thing for washing the molds previous to drying and for a time it was paid for out of the writer's pocket. Work on getting sound steel had progressed also, and the Dutcher's amusement turned to alarm. They couldn't believe what they heard. They came up one day to see, well knowing that Sol would not be present. They departed, sensing their smiling days were over for the secret was out.

This is the first of two articles by Mr. Vickers on the early history of the steel industry in Milwaukee. The concluding article will appear in an early issue.

THE EDITORS.

A. S. A. Re-elects Officers

The annual meeting of the American Standards association, New York, was held in that city Dec. 9, and Bancroft Gherardi, American Telephone & Telegraph Co., New York, was re-elected president. Other officers re-elected include Cloyd M. Chapman, United Engineers & Constructors Inc., New York, as vice president, and John C. Parker, Brooklyn Edison Co., Brooklyn, N. Y., as vice chairman of the standards council. Mr. Gherardi and Mr. Chapman who reviewed the progress of industrial standardization during 1931 reported 27 new national standards that have been completed by the association. Thirteen new national standardization projects also have been started.

Show Foundry Equipment

During the end of November and the beginning of December, 1931, the foundry division of Orga-Metall held an exhibition of imported foundry equipment at Moscow, U. S. S. R. The foundry division of Orga-Metall embraces activities in rationalization of technological and organization processes of Russian foundries, reconstruction of existing foundries, and the establishment and starting of new foundries. The foundry exhibition included molding and sand handling and equipment, cleaning equipment, safety devices, raw materials, and control and testing apparatus.

The Iron Foundry Of the Future

By W. H. Chaffe

Industrial Engineer,
Ford, Bacon & Davis, Inc.

FACING the effects of the present business situation requires a certain amount of courage, but to make the readjustments necessary to cope successfully with the situation requires a far greater amount.

The management of any business or industrial unit is tested most severely during periods of depression, as the periods tend to magnify its structural weaknesses which normally might not be so apparent.

Although practically every branch of industry has been affected to some degree by the present business conditions, the foundry is reflecting the effect of these conditions as well as the effect of conditions which already had existed in the industry. Therefore, the present seems an opportune time in which to analyze these problems, face the weaknesses of the industry squarely and lay the foundation for a stronger and better integrated business structure.

Adopt Modern Ideas

Foundry management has been reluctant in too many instances to accept the more modern ideas of management and keep abreast of the times, consequently it has not been as well prepared to meet conditions imposed by the present business conditions as have other more modernized industries. The few foundries which recognized their internal and external weaknesses and strengthened their positions have met the situation more successfully than the less far-seeing. Those industries which have adopted modern ideas of management during the last few years have been able to reduce production costs, in spite of former increased costs of labor and materials. Notable examples of these are the automobile and tire manufacturers.

The production of the gray iron foundry is affected by the tendency toward more definite specifications and the substitution of sheet metal, steel or alloy steel castings. Many industries, which formerly specified gray iron castings, now are specifying special types of iron castings, steel or alloy steel for their requirements. The most notable example of this is the cement industry, which formerly specified gray iron almost exclusively for its machine requirements, but now requires steel or alloy steel castings for its mills and other machinery. A gray iron foundry in the Lehigh valley, specializing in cement mill repair parts, several years ago furnished gray iron almost exclusively, whereas now only about 10 per cent of the cement mill requirements is gray iron and the other 90 per cent steel or alloy steel castings.

Foundries Are Affected

Although the automotive engineers still are specifying a considerable amount of gray iron and malleable iron for the various parts of the automobile, the tendency seems to be toward more definite specifications for these materials and in some instances fabricated steel, and other materials are being substituted.

The tendency of specifying more definitely to produce certain qualities in the finished product, so as to give the customer better service or produce greater strength with less weight, undoubtedly will affect foundry production either by a loss of tonnage or by requiring greater care in the production of castings.

The gray iron foundry, especially the type producing small and medium-size castings, has been the most seriously affected. With a limited amount of working capital, it is in a serious position, not only as to the present but also in regard to the future, for although the present lack of sales can be attributed mainly to the present business depression, the future prospects under normal conditions indicate a lower demand than in the past.

The foundry as an industry is unusual in that as the demand increases it is comparatively easy to establish increased capacity and when there is a recession in the demand this capacity can be done away with. During the war period facilities of existing foundries were expanded to the limit and new foundries were created to meet the abnormal demand for castings, causing excess production capacity which far exceeded the normal peace-time requirements. However, the number of foundries of all types in the United States, has decreased from 5785 in 1926 to 5425 in 1930, a reduction of 360, or 6 per cent, while the number of gray iron foundries has decreased in the same period from 4044 to 3573, a reduction of 471, or 12 per cent. This 12 per cent reduction, cannot be attributed entirely to a shrinkage in the capacity because a certain percentage of the number has been consolidated with other businesses. There is still apparently an excess production capacity and it is probable that several years will elapse before the demand will absorb the capacity to produce. The foundry is not alone in excess capacity as a great many other industries are in the same predicament today.

Maintain a Schedule

Progress of the average foundry has been retarded by the continued use of old precedents and a lack of sufficient working capital. The lack of specific knowledge of the potentialities of the market and aggressive sales policies have affected the business materially. Without sales research, forecasts and budgets, sales effort can not be directed intelligently.

The co-ordination of sales and production, whereby a fairly constant production schedule is maintained, is essential to any successful business. Fluctuating demand on the shop affects the cost of production and tends to disorganize the personnel. This is noticeable particularly in job foundries which, by specializing on straight job work, without a *back log* of items of a continuous production nature, cause fluctuations in the tonnage produced daily.

Foundries have not taken advantage of experience of other branches of industry in adoption of modern methods of management. Rule of

thumb methods employed will not suffice in the foundry of the future, as better control of labor and materials will be essential to its successful operation. Without proper planning, production and costs will be affected adversely.

The reduction of losses and wastes in the foundry is one of the problems which must be considered, not only the reduction of the percentage of scrap castings, but also other losses and wastes such as heat losses in the cupola, waste of materials, labor losses due to poor supervision, and others.

Introduce Control

Increasing demand for castings of definite specifications requires a more accurate control of the proportions of the melt and cupola temperatures as well as better control of specifications of raw materials such as pig iron, sand, etc., which in the foundry of the past has been left entirely to the judgment of the foreman. Many defective castings can be traced to wrong specifications, improper temperature of the iron when pouring, or to the quality of the sand.

Business practices of the foundry today, although showing the effects of the direction and inspiration of such agencies as the Gray Iron Institute and THE FOUNDRY, are still subject to material improvement. Modern cost methods and budgeting can be used to great advantage in affording an intelligent control of various phases of the business, besides offering better checks on wastes and losses. Comparative labor cost, expense and burden analyses, by which inefficient shop supervision may be detected and corrected, can be used advantageously. More accurate individual job costs and various other cost data and cost reports will tend to produce a more efficient control of operation than usually is provided.

Better control of foundry labor to produce at lower costs is one of the main problems of the foundry and lack of satisfactory wage incentive plants is affecting production costs adversely. Piece-work, which has been employed to some extent, has not been entirely satisfactory as it spurts the productive worker to greater effort but does not offer an incentive to the indirect laborer. Therefore wastes in that type of labor are found frequently in the guise of loafing and stalling.

There are many different types of foundries varying from the well-organized, large-production type to the small job foundry. Therefore, various types of equipment will be found in the different foundries. However, in view of changing conditions of customer demand, it seems advisable today that the foundry spend some thought in studying and analyzing its facilities. Some types of foundry production may not be suitable to production in the cupolas of old design. Many other pieces of inefficient equipment also are employed which tend to increase production costs and place the individual foundry in a poor competitive position.

Handling of materials is a problem of some importance in a foundry due to the comparatively large amounts of material moved. Transfer of molten metal from cupola to mold is one requiring the most modern methods not only because of cost and control of temperature but also for the safety of the workers. Handling of sand, pig iron and coke is of such proportions that it should be given serious study to provide efficient facilities.

Many foundries can trace their origin to small beginnings. As the production increased new additions were made to the buildings in the shape of ells and wings and new pieces of equipment were installed, usually in whatever space was available. Naturally, this has created inefficient floor layouts, requiring an excessive amount of handling and confusion in routing production.

Frequently changes have occurred in the nature of the production which necessitated long hauls of the ladles from cupola to molding floor or of castings from molding floor to chipping and cleaning room. This extra handling increases the costs and adversely affects production in many ways.

Problem Requires Study

The solution of the problems confronting the average foundry will require a certain amount of study and investigation. Analyses should be made to determine the most profitable type of production, the potential market and its location; sales policies should be established definitely by studies of changed requirements; studies and floor layouts should be made to determine the most economical type of equipment required and its proper location. All of this will place the foundry in a better position to meet demands of the market and produce castings profitably at a lower cost.

Sales forecasts, operating budgets, wage incentive plans, cost systems, production planning and other modern aids to efficient management should be installed to place the foundry on a sound, economic basis.

In many other branches of industry, material reductions in costs have been accomplished in recent years in the face of higher labor and material costs, whereas foundry costs have not been reduced except in a few cases where large volume has been produced or modern equipment and methods installed.

Future selling prices probably will not reach the levels of the past few years for some time. Therefore, it will require strenuous efforts on the part of foundry management to produce castings at lower costs to meet competition and make a profit. It will be accomplished only by the introduction of modernized equipment and up-to-date methods of management. The foundry probably will have to look to other branches of industry for ideas which have been instrumental in their success. Old precedents will have to be thrown aside and new ones set up. The purely technical control of the foundry will have to be replaced by a business management, which will inject into the industry modern ideas of management.

The present position of the foundry is such that its problems should be given serious consideration so that the future structure of the business may be strengthened sufficiently to place it in a better position in the metal-working industry.

Solving foundry problems requires skill and a wide knowledge of the most recent developments in successful management, not only in this particular branch, but in industries generally. It may be necessary to call in outside expert assistance to help in making necessary studies and outlining proper policies and procedure.

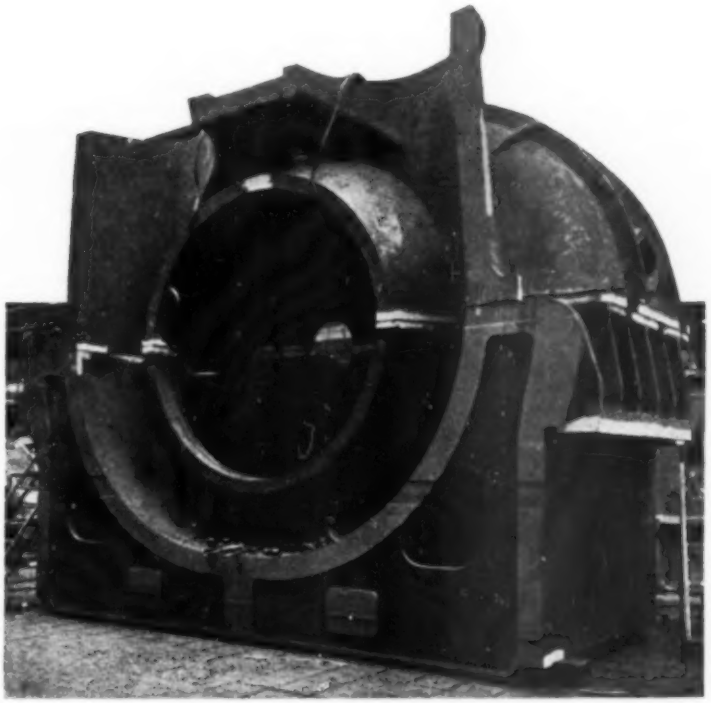
The foundry of the future will be an institution located strategically in relation to its sources of materials and the market for its production. With an aggressive sales organization, the potentialities of its market will be developed fully and new outlets opened up. Sound business management will be employed as evidenced by better control of production, materials, labor and costs. Antiquated equipment will have been replaced by modern type furnaces, handling devices, proper pattern storage facilities, etc. Selling prices probably will be lower but a more favorable profit and loss statement should result.

The average foundry undoubtedly can place itself in a much better position competitively if more modern practices are adopted in the conduct of its business and by employing equipment of more modern design which will enable it to cater to the customers' demand.

Consumption of by-product coke in the foundry industry has increased rapidly during the past 10 years, and the consumption of beehive fallen off according to "Coke and By-products in 1929," a publication of the bureau of mines. In 1918 the consumption of by-product coke was over 1,600,000 tons, and that of beehive coke over 2,200,000 tons. In 1929 consumption of by-product coke increased to over 2,100,000 tons while beehive decreased to a little over 770,000 tons.

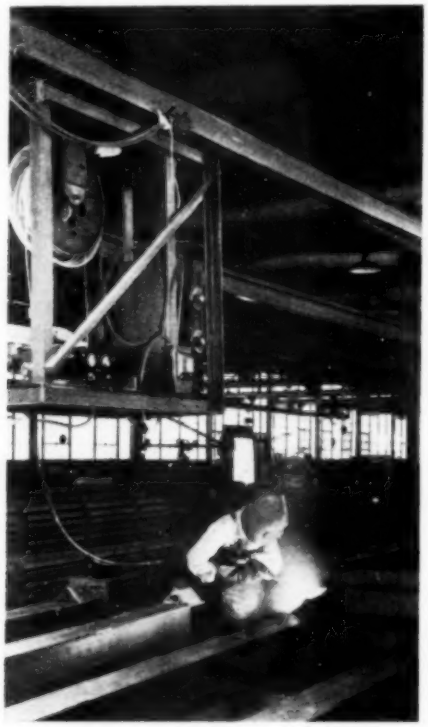
Steel Castings Lead In Exacting *Service* Requirements

By Raymond L. Collier



A Turbine Casing Is Subjected to Stresses

WHEN a manufacturer of a product embodying steel in its construction, through his designers or engineers conceives a new piece of apparatus or decides to make changes in an existing piece, a question often arises on how it should be fabricated. Methods available include casting, welding, riveting and bolting, and while each has its proponents, it cannot be denied that each has a logical, legitimate use. In casting, the part is made initially in one piece while by the other methods, it is built up of several structural shapes joined together by welding, riveting or bolting.



Welding Has a Field in Certain Types of Work

While some few manufacturers maintain steel foundries, the majority of manufacturers purchase their requirements from jobbing steel foundries. The other methods of fabricating usually are conducted in the manufacturer's plant. In recent years, welding has received considerable attention as a fabricating method since its proponents claim that products formed by welding possess advantages equal to or better than those possessed by castings. While welding approximates at least one characteristic of a casting in that continuity of metal section is provided, comparison of welded structures with castings reveals important considerations which should influence designers in the selection of the engineering material best suited to the purpose.

Throw Light on Subject

The facts which follow have been assembled to provide the engineer and designer with data which will throw some light on the subject, and aid them in forming an opinion as to whether casting or welding is the desirable form of fabrication and the source of supply to employ for particular applications. The information is presented without thought of discrediting or deprecating legitimate claims made by proponents of either welding or steel casting. The data has been confined to facts, as it is recognized that each has legitimate and valuable applications in the metal working and metal products consuming fields.

Defines Steel Castings

In a comparative study between welded steel structures and steel castings it may be well to define each to prevent confusion. A nontechnical definition of a steel casting, which will suffice for the present discussion, is a structure composed of a homogeneous material comprising iron with certain smaller percentages of carbon, manganese, silicon, sulphur and phosphorus, with or without other elements, which has solidified from the molten state into an initially malleable mass of the desired, final shape which may be heat treated to change its physical characteristics.

A welded steel structure will be defined as an assembly comprising any kind of steel shapes rigidly joined together by depositing molten metal along the abutting edges or surfaces to be united. It will be noted that the definition excludes all but steel shapes from the assembled parts, but does not restrict the composition of the deposited metal. Also both definitions include the use of alloy steels.

Where not utilized in conjunction with castings, welded construction possesses certain advantages in that no patterns are required, and the cost of patterns and pattern storage is eliminated. Comparatively rapid deliveries may be obtained and some-

times the weight of the structure may be reduced. Cast steel construction has fewer limitations in designing, possesses high rigidity, and has practically uniform strength. The yield point of steel castings is generally higher, most of the castings are heat treated, and under certain conditions they possess better resistance to shock and to dynamic and torsional stresses.

There is some tendency to accept welded products of relatively simple design whereas if a casting were considered there would be any number of lugs, pins, bosses and other projections included in the design. Obviously, all these extras increase foundry cost. If permitted to follow the design of the welded structure a casting would, in many cases, prove more economical. The only true comparison between a given welding and a casting is for both to follow practically identical design, section for section, except where one or the other process makes possible a definite saving without sacrifice of desirable properties.

Gives Disadvantages of Both

Disadvantages of welded steel construction are that jigs and templates may be required for assembly. The original cost, interest on investment and cost of repairs and maintenance on welding equipment must be considered unless the welded structures are purchased from a commercial welding shop. Welded structures are sometimes less rigid, and the strength may not always be uniform. The yield point in the welded areas is sometimes lower than the rest of the structure, although it is claimed the modulus of elasticity is normally the same for cast or welded steel.

Design possibilities are limited due to limited choice of *standard* steel shapes, although special shapes are in some cases justified. It sometimes is impossible to heat-treat welds which require it and there is the cost of stock metal inventory. Disadvantages of cast steel construction are that pattern equipment is required and production in some cases is less rapid.

No effort has been made to arrange the advantages and disadvantages according to their importance. They are set forth from the standpoint of, and addressed to the manufacturer using metal parts in the construction of his products who desires to select judiciously metal components which will impart the maximum ability to withstand service demands, and at the same time reflect the greatest possible economies in production costs.

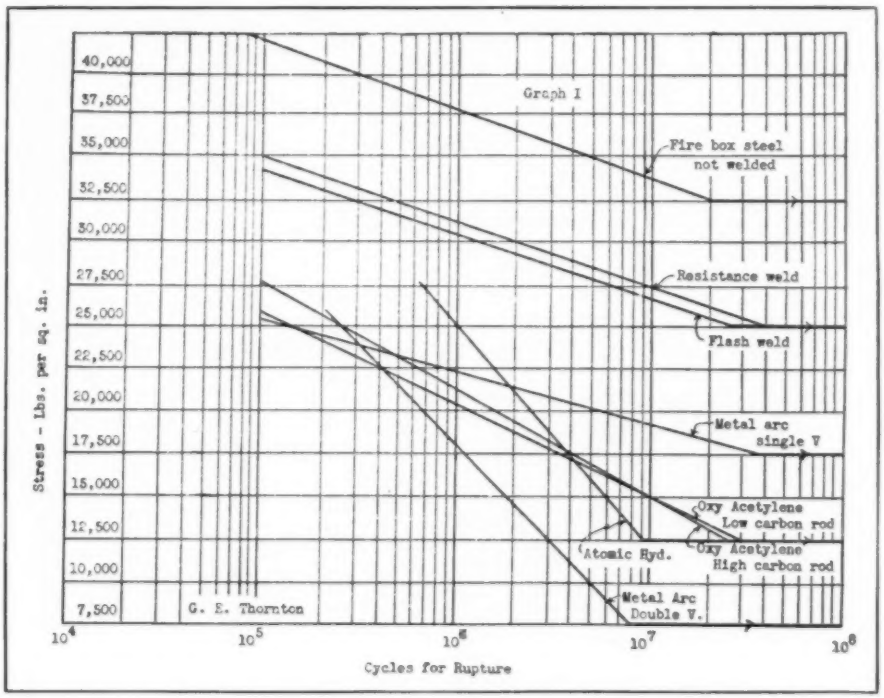
For the purposes of discussion it is assumed that the manufacturer has no facilities for producing either welded assemblages or steel castings, and further that while he might, and probably would install his own welding equipment, he seldom would consider the establishment of his own steel foundry.

The advantages and disadvantages mentioned are for the most part characteristics requiring little explanation, as relatively few exceptions exist. Nevertheless, it may be helpful to discuss briefly each item to prevent misunderstanding.

Welded construction requires no pattern. Unquestionably that is an advantage in cases where a limited few units are required for which pattern equipment would be relatively costly. However, even when only a few parts are needed, if the pattern equipment is simple and inexpensive or already exists, that factor becomes a factor of only minor importance.

Rush deliveries of steel castings on short notice are quite common, and in emergencies, such service generally is available from local jobbing steel foundries which are distributed widely. In the case of parts carried in stock, quick deliveries usually are not a factor, and no inconvenience is experienced provided reorders are placed sufficiently in advance of requirements.

While it often is stated that welding permits the use of lighter sections, that is not a general rule applicable in all cases. Sectional thicknesses frequently are limited, and can be neither increased or decreased. After heat treatment, regular plain carbon cast steel has high tensile strength and yield point, and excellent ductility and reduction of



Endurance Limits of Unwelded and Welded Fire Box Steels which Are Located at Those Unit Stresses for which the Stress-Cycle Diagram Becomes Horizontal

Pattern equipment is of slight importance if any considerable quantity of units is involved, as the cost is distributed over a large number, making the unit cost quite small. It also may be pertinent to mention that often in the production of a relatively few parts by welded construction, it is sometimes necessary to construct special templates and jigs to facilitate accurate alignment and articulation of the members.

It may be possible to reduce delivery time somewhat by using welded construction, and that is a factor when a part is needed in a hurry. The saving of time to some extent is contingent on the user having the necessary welding equipment and facilities in his own plant. If the work is to be done in a commercial welding shop, he will have less control over that particular phase of the job.

area which makes it just as strong and dependable—section for section and part for part—as the structural steel ordinarily used in welded fabrication.

Plain commercial carbon cast steel of the grade most in use will run on the average about 70,000 pounds per square inch tensile strength compared to 45,000 to 68,000 pounds per square inch for various structural steels. Since a wider selection of alloy steels with higher physical properties are available from the steel foundry, it often is possible to reduce metal sections by resorting to the cast form.

If a manufacturer desires to build his own welded parts, he first must provide floor space for carrying on the work and for storing the raw materials. That is an item of overhead which often is overlooked.

Welding and cutting equipment and auxiliary machinery must be installed unless the latter already is on hand, and in addition to the original cost of that equipment, there is the interest on investment, cost of repairing and maintenance, as well as provision for depreciation and obsolescence.

The cost of carrying an inventory of stock shapes, various types of welding rods, the cost of gas or electricity used in welding operations, and power required for operating the auxiliary machinery, etc., must be considered, as many times some of those elements of cost are overlooked in developing comparative costs. The matter of layout and preparation labor alone may constitute a large proportion of the total cost.

In general, a properly designed casting will be found more rigid than a built-up part. Of course, there are exceptions where welded structures and castings are nearly on a parity. When certain kinds of vibrational, bending and torsional stresses are present, welded structures are not satisfactory and a steel casting is unquestionably preferable when dynamic stresses are concentrated in or along weld areas. In such cases, design is an important factor. Welds properly made will stand up under moderate tensile and compressive loads.

Chart Shows Fatigue Strength

Published data available so far do not indicate that two pieces of metal can be joined by welding with a resulting fatigue strength equal to that of a continuous piece of metal of the same composition and sectional thickness, as may be seen by consulting the accompanying chart which is taken from a bulletin entitled "A Study of Welded Metals Under Fatigue Tests," State College of Washington, Vol. 11, No. 11, April, 1930. It is worth noting, however, that the new *fluxed* rods, as sold by several leading producers, are said to give fatigue tests equal to boiler plate. A steel casting when properly designed is considered as an integral, continuous, homogeneous unit without points or areas of weakness.

It has been estimated that one out of every five welded structures requires heat-treatment to relieve stresses set up in the adjacent metal and to refine the grain structure of the deposited metal. In such cases, the welding fabricator must install an annealing furnace or send the work to a commercial heat-treating establishment. The steel foundry anneals all castings with some exceptions in the case of those made of 0.20 per cent carbon or less, to develop maximum strength and other desirable properties.

The fact that there is not an unlimited variety of sizes and shapes of rolled stock available for adaptation to welded construction necessarily restricts the scope of the designer who sometimes must compromise appearance, desirable proportions and contours so that standard shapes may be used. There is far less limitation with steel castings as they can be made to contain all the convolutions and graceful outlines of pleasing appearance without sacrificing any physical properties if the sections are kept reasonably uniform in thickness, corners filleted properly, and other simple rules observed.

Proper Design Is Essential

A thorough knowledge of proper design technique is essential to produce good castings and welded structures. In designing for cast steel, it is not necessary to make so many strength calculations because the metal sections are continuous and not subject to the possibility of weakness at one or more points. A part requiring ten welds may have nine satisfactory joints and a faulty tenth. Consequently, the designer must play safe and base his figures on minimum factors for strength to make allowance for possible defective welds at certain points. Poorly designed castings also have points of weakness.

Considerable effort has been expended in the search for more reliable methods of testing welds and castings without destroying them in the process of inspection, and substantial success has been attained, although the author has never heard of a wholly satisfactory method of inspecting the soundness of *fillet* welds. Sustained efforts are being made to bring the actual welding process under more exact control. By far the greatest number of welds are performed by manual operation, and that means men of exceptional skill and ability are required to insure against excessive waste due to faulty work.

In the production of steel castings, there also is a need for skilled workers as the production of steel castings in the modern foundry is a highly scientific art. However, the knowledge, experience and technical skill required in the two fields differ in kind and degree, and in no way are directly comparable.

There is no desire to minimize the value of the welding process in assembling many different kinds of products. In addition to applications where only a few units are wanted and where service conditions make an integral steel casting out of the question, there are many instances where the welding process can be used advantageously to join several steel castings, or unite a steel casting to a steel forging or rolled components. However, where stresses are concentrated at the welded joints, under severe vibration, torsion or other dynamic stresses, a properly designed and well-made steel casting will be found more satisfactory.

While welding has its place, it may be helpful to clarify its satisfactory fields of application by giving a few examples of where its use is doubtful. For example, end trucks and trolleys for overhead cranes usually are subject to considerable vibration and frequent bending stresses in operation. No compromise with safety is justifiable in an application of that sort, and the majority of those parts and equipment at present are steel castings.

Logging arches used to drag out heavy logs in the timber regions have gone to integral cast steel construction because of the buffetting and severe usage that they must withstand. Railway car side frames all must be steel castings after a certain date as it has been found that other types of construction do not stand up well under the stresses imposed.

While those are but a few of the many examples wherein steel castings serve more advantageously than welded structures, many applications have been developed in which welded structures have been found highly satisfactory. However, those discoveries seldom have meant a change from steel castings to the welded structure. Rather, the steel foundry often has been found a valuable complement to those developments.

Meet Exacting Service

Occasionally the integrity of steel castings has been questioned and impugned. That poor castings as well as poor welds sometimes are made, no one denies, but the wide diversity of application of steel castings attests that they can be relied upon for the most exacting service. For example, the locomotive main frame subjected to a host of complex stresses must be absolutely reliable, and what do we find? The whole main frame of cast steel made in one piece, and often with the cylinders integrally cast on to boot!

Selection of fabricating medium is somewhat complicated by the possibility of using two or more castings welded together, or castings welded to rolled or forged sections. A judicious study of the service requirements will usually furnish the correct answer to questions involving choices from among several alternative methods.

Whatever the merits or disadvantages inherent in steel castings and welded construction, there can be no doubt that cast steel is an exceptionally good material for construction, and that welding, properly used, is satisfactory and has a wide range of application.

Steel founders are committed to

(*Concluded on Page* 59)

Several Methods Available for Cupola Drop Disposal

By Norman F. Hindle

MANY foundrymen, especially those who learned their trade in the era preceeding the industrial development of the past 20 years, have the idea that the proper method of doing a certain operation is the manner in which they were taught and that the method is not open to improvement. As an instance, consider disposal of the cupola drop. For many years, when the bottom was dropped the material was wetted down under the cupola and allowed to cool until the following morning when the men appointed to that task would separate the coke from the iron.

That method was regarded as proper until a relatively few years ago when some enterprising foundryman decided it would be easier to work on the dump if it was pulled into an open space either in front of or at the rear of the cupola. That method has been known for several years, but it is surprising to note how many foundries still use the older method.

It is rather difficult to point out the exact dollars and cents benefit of the newer methods but at least six advantages may be listed. The first is that the dumped material may be worked on easier. If the dump is left under the cupola, the men must work in a cramped position. That applies to the general run of gray iron foundries, although a few shops operate large cupolas, 80 inches diameter or larger where a man has sufficient room to stand. However, those are in the minority.

Pulling the drop from beneath the cupola makes the work less fatiguing to the workmen. As they are not forced to maintain a cramped attitude. The work is less difficult and a greater day's work may be expected. In the average foundry where melting is done during a 2 or 3 hour period in the afternoon the men can work more easily and steadily until the drop is removed, then they are available for other duties.

Where the drop is removed, it will cool quicker than if it is left under the furnace. That is due to several reasons. Circulation of air in the open, promotes quicker radiation of heat. Removal of the drop from close proximity to the hot interior of the cupola allows it to cool more rapidly.

The final advantage applies generally to shops which melt during the entire day, say from 7 a.m. to 5 p.m. In those shops the immediate removal of the drop from beneath the cupola practically is essential, because it allows the furnace to cool more quickly. It allows the cool air to flow upward through the stack not only in a greater volume, unobstructed by the drop, but also at a lower temperature because it is not heated by flowing over the drop. In large shops work begins on the furnace approximately at midnight so that it will be ready to melt at the desired time. That applies especially to shops pushed to all their available melting capacity.

Another reason for pulling the dump from under the cupola is that if left beneath, the coke continues to burn. However, if withdrawn, excess circulation of the air allows the coke to cool faster. Combustion is stopped in a shorter time thus allowing a greater reclamation of coke.

At least two methods are available for the removal of the drop from beneath the cupola. In one a car mounted on a narrow gage track runs under the cupola in a pit sufficiently below floor level to allow the bottom doors to swing freely. In the other a drag or skid is employed. The first method never has been adopted to any extent because of the inherent difficulties involved. The dump must be removed from the car while it is hot to avoid heating and injuring the car.

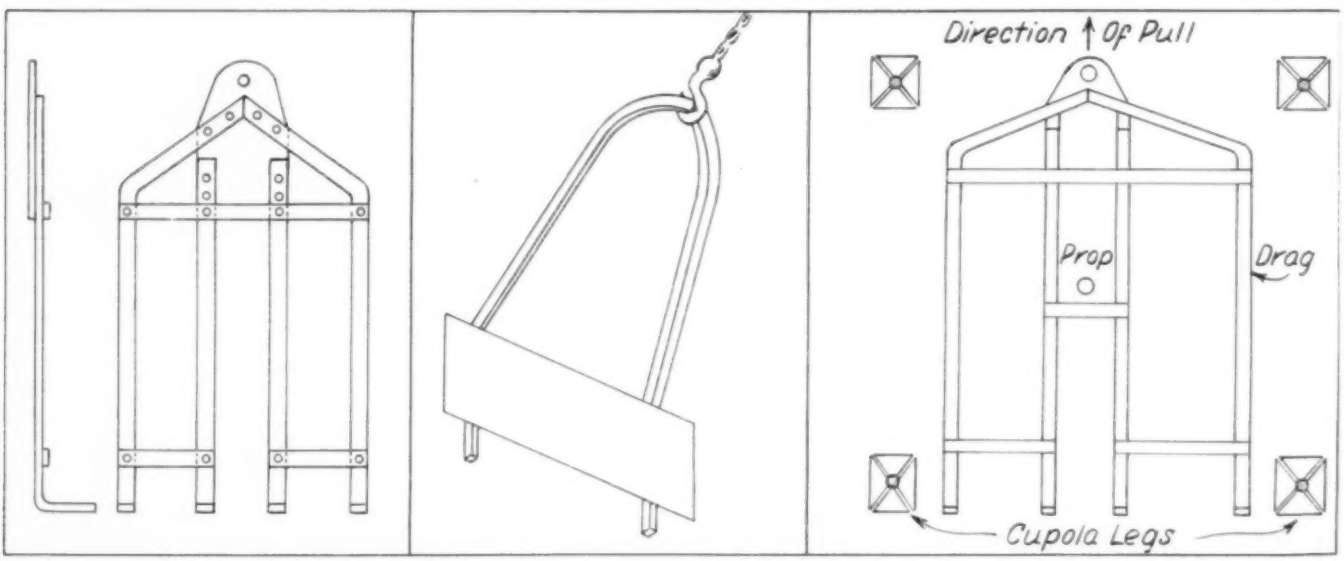


Fig. 1—(Left) A Convenient Type of Drag for Removing the Cupola Drop. Fig. 2—(Center) A Simple Device for Accomplishing that Work. Fig. 3—(Right) Pulling the Drag Also Loosens the Props and Drops the Doors

Considerable room also is required for handling the car after it has been withdrawn from beneath the cupola.

Probably the greatest danger involved is from explosions caused by water which may find its way into the cars. James A. Murphy, in an article entitled, "Reveals a Way To Light the Foundry Floor," which appeared in the April 1, 1930, issue of THE FOUNDRY, relates in a humorous manner the result of such a condition. In this instance no lives were lost by the explosion but all the windows in the shop were blown out.

However, the car is used in one large shop in another way. First the dropped material is pulled from beneath the cupola on a skid and is broken up in close proximity to the cupola. Coke and iron are reclaimed and that part of the material which cannot be utilized is thrown into the car and transported to the dump.

A typical skid or drag, a fabrication of steel strips 3 inches wide and ½-inch thick riveted or welded together is shown in Fig. 1. A skid of this type may be secured from one manufacturer of foundry equipment.

Skid Is Placed First

Before the bottom doors are propped in place, the drag or skid is placed under the cupola. When the required amount of metal has been melted and the blast has been shut off, the bottom doors are dropped by releasing the props. The remaining burden drops from the cupola onto the skid. The drop then is cooled with water and withdrawn from under the furnace to where the men may work on it most easily, either at the front or at the rear of the cupola.

A home-made skid recently seen in a Cleveland foundry was simpler in design and construction. A 1½-inch square bar was bent to a *V* shape with the ends extending upward as shown in Fig. 2. A cast iron plate set against the extensions after the bottom has been dropped, acts as a hoe and drags the dump in front of the cupola, where it is picked over.

The drag is removed from beneath the cupola by a hook and cable. The cable passes through a snatchblock, anchored to a deadman in the floor, and then up to the crane hook, in such a manner that the pull from the crane hook is practically vertical. If space is available at the front of the cupola and a crane is located in that bay, removal is accomplished easily in the manner described. The same conditions apply to withdrawal from the rear, if equipment and space are available.

However, if the plant is equipped with crane facilities at the front of the cupola but space limitations prevent the dump being dragged to the front, a different situation arises. If space is available neither at the front nor at the rear, the drag may be pulled toward the side, providing it will clear the doors, by locating the snatchblock on whichever side is desirable.

If space is available at the rear and crane service at the front, three snatchblocks or pulleys will be necessary, one located at the rear, another either to the left or right rear of the cupola as desired and a third in the bay to give the vertical crane pull.

Where sufficient crane service is not available or where no cranes are installed, some companies use hand-power winches located on the charging floor. Other equipment that may be used for that purpose include electric motors and hoists of various types.

Large cupola bottom doors generally are supported by three props, the two outer props being of slightly less cross section than the center prop which supports the majority portion of the weight. The two outer props are pulled from the bottom first and then the center prop is pulled with a long bar hooked at one end so that the operator may stand a considerable distance from the furnace when performing that operation. That method of dropping the bottom is in general use.

In some dump removal methods the drag is so constructed that when the crane begins to pull the skid, the skid automatically pulls the middle bar, after the outer props have been removed, and dumps the bottom. When the skid is pulled, a cross bar engages the prop, as shown in Fig. 3, and exerts a pull which loosens the prop and drops the door.

Book Review

Tolley's Complete Income Tax Chart, 16th Edition, 1931-32, containing 19 folded charts, 5¼ x 8¾ inches; published in London by Waterlow & Sons, Ltd., London Wall, London, E. C. 2, and obtainable from the Penton Publishing Co., Ltd., Caxton House, Westminster, London, S. W. 1.

Firms having controlled interests in Great Britain will find this guide useful in computing the income tax to be paid by British companies. This year's chart has been revised, and incorporates statutory alterations, concessions, changes in the practice, and cases in the courts affecting income tax to July, 1931. The chart includes the alterations brought about by the last finance act, including the new section relating to tax deduction from company dividends, and the important addition of the land value tax, which is dealt with in a special supplement and which will be enforced next year.

The annual report of the director of the bureau of mines, Washington, containing information on the work carried out by that department during 1931 recently has been published. Copies may be obtained from the superintendent of documents, Washington, for 10 cents.

Philadelphia Meeting to Feature Design

The important question of castings design will be considered at Philadelphia, Jan. 13, at a special meeting of the Philadelphia Foundrymen's association and the American Foundrymen's association in the Philadelphia district. Because of the importance of the subject from an engineering standpoint, members of the Philadelphia section of the American Society of Mechanical Engineers, and other engineers in the surrounding territory are being invited to participate.

An interesting program has been arranged by the sponsors of the meeting, stressing the importance of maintaining closer co-operation between the engineer, designer and the foundry to the end that castings of the best physical properties may be produced most economically for specific engineering requirements. Several worth-while papers will be presented, for discusison by those who attend.

Three speakers have been secured to deal with problems of castings design for various cast metals as follows: H. J. Rowe, technical control and development section, Aluminum Co. of America, Cleveland; K. V. Wheeler, general manager, Lebanon Steel Foundry, Lebanon, Pa.; B. H. Johnson, R. D. Wood & Co., Philadelphia.

The meeting will be held at the Manufacturers' club, and will be preceded by a dinner. Officers of the Philadelphia Foundrymen's association, who are collaborating with the A. F. A. in arranging and sponsoring the meeting are as follows: President, J. B. Greenstreet, Olney Foundry Co., vice president, C. W. Yost, The Midvale Co., secretary-treasurer, E. S. Sparks. Directors of the association are: W. S. Blessing, Moore & White Co.; G. L. Coppage, Pusey & Jones Corp.; G. H. James, American Engineering Co.; F. H. Loeb, Wm. Sellers & Co. Inc.; L. U. Park, Park & Williams, Inc., and Chas. E. Schley, Pennsylvania Bronze & Brass Co. Inc.

Foundrymen and engineers of the district will find the meeting especially valuable and are urged by the sponsors to plan to attend. The meeting will be open to all, and those desiring to make reservations for the dinner should communicate with the secretary of the Philadelphia foundry group, E. S. Sparks, 1623 Sansom street, Philadelphia, as soon as possible.

H. M. Lewis Co., Jackson building, Buffalo, has been appointed representative in the Buffalo territory for the Universal Sand Equipment Co., Cleveland.

Prevent Losses With Proper Gates and Risers

By Pat Dwyer

THREE typical castings shown in Figs. 127, 128 and 129 have been selected for comment in this, the twenty-fourth and last article in the gray iron section of the present series on gates and risers. Future articles in the same series will deal with some of the problems of the nonferrous foundry, the steel foundry and the malleable foundry, in the order indicated.

The casting shown in Fig. 127 is a thin, flat, circular cast iron plate 30 inches in diameter, 3/16-inch thick with a small hub and eight radial ribs on one face and reinforced with a light bead or projection around the perimeter of the same face. A casting of this kind, particularly where it is introduced for the first time, usually creates a lot of trouble before a satisfactory casting is secured. Even so, unless the case has been studied carefully, unless the cause has been established definitely and unless a specific remedy has been adopted, the experimental stage may have to be gone over again, the next time the casting is ordered.

Guess at the Cause

As a last resort the casting may be left in the mold over night with the cope and drag clamped together tightly. Unfortunately, unless other conditions are favorable, this treatment will not insure a straight plate. The instant it is released from the mold it will spring out of shape practically to as great an extent as if it had been shaken out while hot.

Without an intimate knowledge of all the features in connection with the production of a warped plate, it is extremely hazardous to venture a guess at the cause. The fault may lie with the flask, the sand, the ramming, the force with which the metal has been poured, or with the shape and location of the gates and runners. Any one, or a possible combination of two or more of the foregoing factors may be responsible.

The most probable cause is an uneven thickness of metal with the thickest section in the center. As a result, the center cools last and springs the remainder of the plate out of shape. This extra thickness in the center may be due to a sag in rolling the mold over, to a soft drag that sinks under the weight of the metal, or to a weak cope that springs in the center from the pressure exerted when the mold is filled with liquid metal. A 30-inch diameter plate under a 6-inch head of metal will exert a total pressure of 1100 pounds against the face of the cope.

In the majority of instances the investigator will be surprised when he breaks one of these castings, to find a marked difference in thickness between the area in the center and that near the circumference. However, this condition should not be accepted as prima facie evidence that the gates are too large or that the cope is not suitable. Attention should be directed to the method of pouring. The head may be unnecessarily high and the metal may be driven into the mold with unnecessary force. These factors in turn may be due to the attempt to pour metal at a temperature that renders it sluggish.

Pouring metal at a low temperature, except under exceedingly exceptional conditions is a hazardous proceeding and is particularly inadvisable with molds for thin castings. Even with hot iron the molder will experience difficulty in producing large thin plates of uniform thickness. With dull iron the task is impossible. Driving the metal into a mold with unnecessary force strains a mold which under more favorable conditions might turn out a satisfactory casting. Position of the gates sometimes is a contributory factor toward a warped or strained casting.

Bearing the foregoing features in mind the following procedure should be adopted in molding and pouring a casting similar to that shown in Fig. 127. The first and perhaps the most important item on the list is a good stiff flask. A mediocre flask may be adapted, reinforced and braced by a man with sufficient experience to realize the strain to which it is subjected, and with sufficient practical knowledge to know how to apply the reinforcing members. However, a good, stiff flask automatically removes one of the hazards of the job and should be specified where accurately dimensioned castings are expected.

Roll on Level Bearing

Sand in the mold for the plate should be rammed firmly and then struck off flush to form a proper seat for the bottom. The drag should be rolled over and placed on a firm, level bearing, preferably a concrete floor. Unless the bottom board is rigid and unless it is supported properly underneath, it will sag and as a result the casting will be thicker in the center than in the vicinity of the edge.

The best and safest method for gating this casting is to place a sprue at each corner of the flask. Metal from four hand ladles poured simultaneously would enter four runners at the joint line of the mold and these runners in turn would deliver

Why Castings Warp

CASTINGS warp through a variety of reasons in which the gates may or may not be implicated. In some instances the cause is quite patent and is apparent even to a person of limited experience. In other instances the cause is more obscure and only can be discovered by a patient system of study, followed by trial and elimination. The most aggravating type of warp is one in which one or more castings from a batch are warped while the remainder are straight. Usually in cases of this kind, the fault can be traced to the manner in which the castings are shaken out. So far as possible a casting should be gated in a manner that will equalize the cooling speed in the different areas. Castings of fairly uniform cross section sometimes warp where an unequal thickness of sand in the mold allows the heat to radiate much faster from one part than from another.

the metal to the mold through an almost continuous series of branch gates. In this manner the mold will receive metal simultaneously from all around the circumference.

Naturally the center of the plate will be the last part to cool, but by this distribution of gates around the rim, the cooling speed will be approximately equalized over the entire casting. The runners are broken after they have solidified and the plate is left in the mold until it becomes cold.

A different set of conditions surrounded the long grate bar casting shown in Fig. 128. These castings were made in lengths between 56 and 120 inches. Sometimes the castings were warped but not always in the same manner. Sometimes they buckled up in the center and at other times they pulled in the opposite direction. The patterns were straight and there was nothing in the design to cause undue contraction at any one point. Curiously enough all the trouble in this instance was developed in the shorter bars, those between 56 and 83 inches. The longer bars did not warp. Straight edges were employed to verify the straightness of the cope and drag before the molds were closed. The molds were poured two-up at each end also one-up at each end with a third gate near the center as shown in Fig. 128, but still the castings came crooked.

Another peculiar feature in connection with this problem was that occasionally all the castings poured from a heat came straight, but more frequently a number, as high as 40 per cent, were warped while the remainder were straight. In an endeavor to solve the mystery, the castings were poured with iron at various temperatures, but apparently that factor was not responsible.

Blame the Shakeout

In the investigation of this problem, all the possible contributory factors—with the exception of one—were eliminated. The evidence submitted seemed to indicate that the manner in which the castings were shaken out, was responsible for the trouble.

If these castings are stripped while they are red hot, they certainly will warp and the warp will be in the direction of the side that is exposed to the air. For example, if the copes are thrown off first, the ends of the castings will rise. However, if the drag is dumped immediately afterward so that the under side of the casting is exposed, the ends of the castings will pull in the opposite direction.

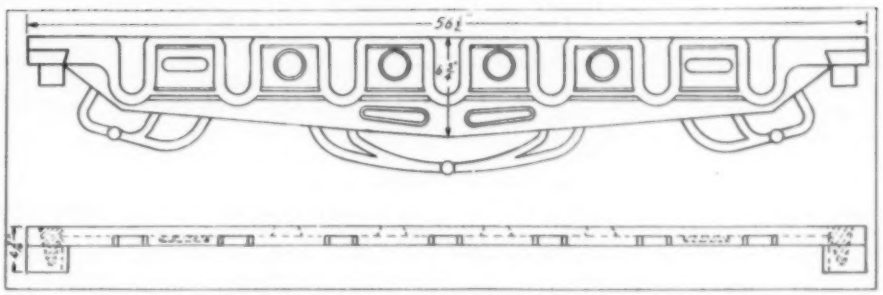


Fig. 128—An Even Distribution of Metal Through Three Sets of Gates Prevents the Casting from Warping

Exposed Bars Warp

This is a fairly common phenomenon in foundries where long, plain grate bars are molded on edge, four in a flask. If the flask is removed in such a manner that the block of sand and the castings are left resting on the bottom boards, and further, if the sand falls away from the outside of the two outer bars, then inevitably the ends of these two bars will spring outward from ½ to 1½ inches. The two inner bars, protected by sand on both sides will remain straight.

The fact that the long bars of the type shown in Fig. 128 do not warp, indicates that the shakeout methods are to blame for the warped castings. The copes for the shorter bars are shaken out by two men who lift the copes without rapping them and throw them down. This treatment leaves the upper side of the bar exposed to the cooling influence of the atmosphere while the lower side remains in contact with the red hot sand.

Long copes are too heavy to be handled in this manner and therefore they are rapped with a sledge hammer or a wood maul before they are lifted. As a result all or practically all the cope sand remains as a cover on the casting.

If all the castings warped it might be necessary to leave them in the molds until they had cooled, or, alternative method, they might be shaken out immediately after they are poured and laid on parallel supports so that the air should have equal access all around them.

In some instances where shallow copes are employed, warpage is overcome, or rather prevented by butting the sand all over after the mold has been filled with iron and then allowing the casting to remain in the clamped flask until it has cooled. This treatment is based on the fact that the heat from the casting radiates through the shallow cope faster than it does through the drag. Consequently the upper side of the casting cools first. Butting the sand makes it denser and a better holder of the heat.

Solved the Problem

The fact that the greater number of the bar castings were straight indicated that the design of the pattern was not responsible for the trouble. The same reasoning applied to the temperature of the iron and the manner in which the gates were distributed. A check-up on the shaking out method solved the problem.

The last casting selected for illustration is a hollow roll approximately 8 feet in length 13 inches diameter outside and 9½ inches diameter on the inside. These castings are made in dry sand molds and are poured from various mixtures of gray iron. Usually the castings are straight, but occasionally one or more are warped. When this happens for the first time, the foundryman usually is at a loss to account for it. The trouble may be due to a warped pattern, a crooked core, or by an unequal thickness of sand around the casting.

In some instances, and this applies particularly to molds that are made by pulling a short section of pattern upward until the desired height is

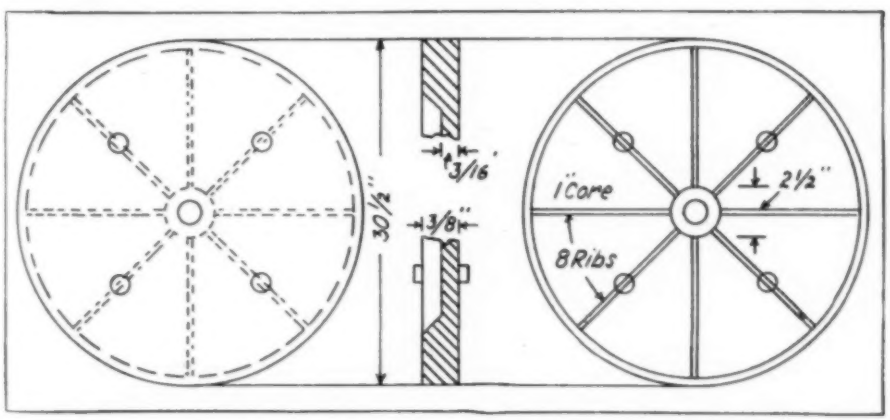


Fig. 127—Unless the Cope Is Unusually Rigid the Casting Will Strain the Mold in the Center and Cause Unequal Thickness

reached, the crooked casting is a product of a crooked mold. The molder does not exercise sufficient care in drawing the pattern at each stage and the result is that it gradually departs from a straight line.

However, the most prolific cause of warped rolls is unequal thickness of sand around the casting. Where the roll is molded on end in a round flask, the inexperienced man will keep the pattern close to one side to make room for the upright sprue. In a case of that kind the roll invariably will warp, because the heat from the thin body of sand on one side of the mold will radiate much faster than the heat from the side carrying the sprue. The cooled side will contract first, pull the ends of the casting toward each other and spring the opposite side out in the center. This opposite side will contract later, but cannot do so normally on account of the resistance offered by the side which already has set and become rigid.

Provide Extension Pocket

A familiar example of this phenomenon is seen every day in casting open sand plates. If these castings are left to cool naturally, that is without further attention, the ends will spring up, due of course to the fact that the upper face cools first and commences to contract. The common remedy for this is to shovel sand over the ends and leave the center uncovered, thus equalizing the cooling process.

In regular roll shops this tendency is overcome by providing extension pockets on the flask sections to carry the upright sprue. In some installations a pocket is provided only on the bottom flask section. The remainder of the sprue is formed in a long runner box and clamped to the drag section in the process of assembling the mold. With either style of flask, the roll pattern is kept in the center and surrounded by a uniform thickness of sand.

Where rolls are cast only occasionally, and where, for any reason, a bottom gate is considered necessary, square flasks are the most suitable, because the sprue can be erected in one of the corners and the roll pattern can be held in the center of the flask.

In the majority of instances the metal can be poured in at the top of the mold and plain round flasks can be employed for making the mold. The particular casting selected for illustration in Fig. 129 may be poured through six ¾ x ½-inch pop gates evenly spaced around the top. To insure a perfectly clean casting it might be advisable to dispense with the usual cope.

A loose wood ring 1½ inches thick and with the inside diameter conforming to the diameter of the roll pattern, is formed on the band saw and slipped over the top of the roll pattern. A flat, round corebox corresponding to the shape and size of the ring and containing small upright blocks nailed to the wall to form the gate openings, may be used to form the cover core.

After the mold is dried and the upright core set, the ring core is dropped into place thus automatically centering the upright core. A wooden block to form the basin is placed over the gate openings, followed by a shallow flask ring which serves to hold the green sand rammed around

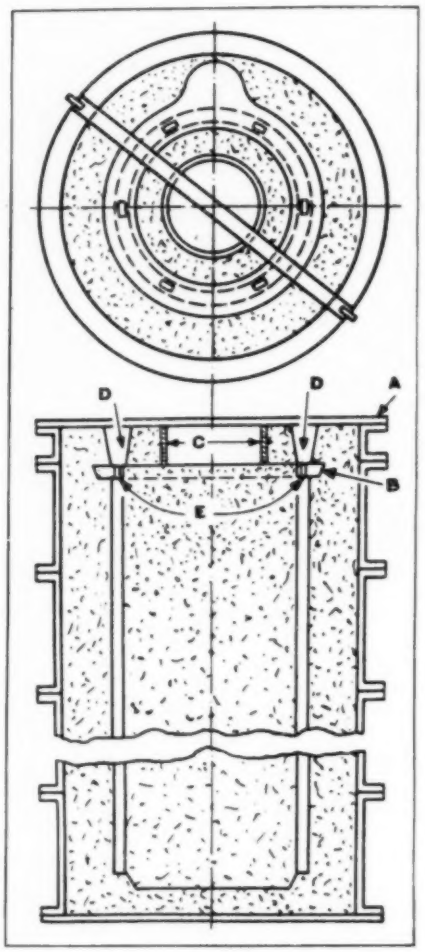


Fig. 129—Plan and Longitudinal Section of Roll Mold Poured Through the Top

the basin block. An iron bushing ring or other suitable packing material on top of the upright core can be secured by a flat strap clamped across the top flange of the flask. The general arrangement is shown in Fig. 129.

Where cylindrical cored castings are molded horizontally in a split flask and upended afterward for pouring, it sometimes happens that the mold is sprung in the center from insufficient support under the center of the rollover board while ramming the drag. Sometimes the same condition obtains after the mold has been rolled over. This will result in a thick and a thin side on the mold after the central core is placed. When the casting is poured the thin side contracts first and the casting will be crooked irrespective of whether or not it is in the center.

This is the twenty-fourth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The twenty-fifth installment will appear in an early issue. —THE EDITORS.

Operating Problems Are Talked Over

The home talent meeting of the Wisconsin Gray Iron Foundry Group was held Dec. 9 at Hotel Schroeder, Milwaukee, with Prof. R. S. McCaffery, University of Wisconsin, Madison, Wis., presiding. R. M. Kanik, Moloch Foundry & Machine Co., Kaukauna, Wis., described practice he had found advantageous in his plant when operating under reduced schedule. He stated that he was able to effect savings and reduce waste without reducing his list of salaried key men. Other members mentioned savings that were the result of an intensive campaign in their foundries. These included savings in the amount of compressed air used, amount of water used, and recovery of iron from the yard. In one small foundry the latter amounted to between 10 and 15 tons over the past 2 months. Reduction of the grades of pig iron carried in inventory also was mentioned.

Nonferrous Practice Is Discussed

The December meeting of the Philadelphia Foundrymen's association was held at the Manufacturers' club, Philadelphia, on Dec. 9 with a large attendance. Discussion on the "Report of the Nonferrous Committee of the American Foundrymen's Association on Recommended Practices" was led by Charles E. Schley, president, Pennsylvania Bronze & Brass Co. Inc., Philadelphia. C. F. Hopkins, Ajax Metal Co., and Earl Eastburn, Phosphur Bronze Smelting Co., both in Philadelphia, with others presented interesting comments on the subject from many angles including the commercial as well as the technical.

Stabilizing Industry

American industry has long since passed the point where trade associations would curtail production, causing increases in prices,Gerard Swope, president, General Electric Co., told members of the Academy of Political Science, New York, recently in an address, answering some of the criticisms aimed at his industrial stabilization plan. "What an industry would endeavor to do," he said, "would be to prevent overproduction.

Steel Founders Vote Adherence To A.S.T.M. *Specifications* For Railroad Castings

Steel Castings Are Important in Locomotive Construction

OPPOSITION to changes in the required tensile properties for railway castings was voiced at the meeting of the Steel Founders' Society of America in Pittsburgh, Dec. 10. The society adopted a report of a special committee on A. R. A. specifications, of which A. F. Lorenz Jr., American Steel Foundries, East Chicago, Ind., is chairman, definitely committing the membership of the society to exclusive adherence to the castings specifications as promulgated by the American Society for Testing Materials, at the present time and until in the future there might be manifested an unanticipated disposition on the part of the A. S. T. M. to adopt such requirements not in accordance with the best interests of steel foundrymen.

The adopted recommendation also states that such a commitment would not obligate any member of the Steel Founders' society to refuse to manufacture materials according to more impressive combinations of physical properties than are found in any A. S. T. M. or other nationally recognized specification. However, the obligation would commit the S. F. S. A. member to a policy of reasonably requiring higher prices than are asked for regularly when material of the well-known carbon grade is demanded according to specifications that are more exacting than those approved by qualified bodies, for that grade.

The committee report was presented by Arthur Simonson, Falk Corp., Milwaukee, and before adoption was discussed by a number of members including S. Wells Utley, Detroit Steel Casting Co., Detroit; W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.; W. J. Corbett, Fort Pitt Steel Casting Co., McKeesport, Pa.; and R. A. Bull, Electric Steel Founders' Research group, Chicago.

The meeting was opened by W. H. Worrilow, president of the society, who introduced W. W. Powell, Mesta Machine Co., Pittsburgh, and vice president of the society, who presided. R. F. Nash, Pettibone-Mulliken Co., Chicago, as chairman of the cost committee, reported the completion of the uniform accounting and cost plan of the society. The committee and the cost engineer of the society recently completed a standard estimate form based upon a study of forms in use by member companies. The standard estimate form recently was issued as supplement No. 1 to the uniform accounting and cost plan. R. L. Collier, assistant to the managing director, reported on the progress made by the subcommittee on recommendations to designers, of which R. S. Munson, Atlantic Steel Casting Co., Chester, Pa., is chairman. The final report of the subcommittee will be ready for submission to the technical research committee in the near future.

Granville P. Rogers, managing director of the society, outlined the symposium on steel castings to be presented at the 1932 convention of the American Society for Testing Materials. The symposium will include a general survey of the steel castings industry, data on test bar specifications for both carbon and alloy steels, a discussion of the general principles of design as indicated by physical properties, the heat treatment of steel castings, and the development of alloy steels. F. A. Lorenz Jr., is preparing a paper also to be included in the symposium. Mr. Rogers also announced that the annual meeting of the society will be held in the Stevens hotel, Chicago, Jan. 20 and 21.

If two structures, one of cast steel and the other fabricated by welding, are made from exactly the same design, the steel casting is the better from the point of view of strength, according to J. G. Ritter, welding and foundry engineer, Westinghouse Electric & Mfg. Co., Pittsburgh. In a paper, "The Use of Steel Castings in Welded Structures," Mr. Ritter stated that most of the publicity given welded structures in the past few years has been somewhat warped. Growth of welding may be attributed to intensive publicity and psychological effect of a new process.

Mr. Ritter believes that through the presentation of proper information on steel casting design, a substantial part of the tonnage formerly made in cast steel and now being welded, will be returned to the castings shop. Some tonnage will

(Concluded on Page 54)

Questions & Answers on FOUNDRY PRACTICE

THIS department covers all problems relating to metallurgical, melting and molding practice encountered in making steel, malleable-iron and gray-iron castings. Questions submitted by bonafide subscribers to this department will be answered by members of the editorial staff of The Foundry, supplemented where occasion requires by the advisory staff whose personnel is as follows:

John H. Hall
Cast Steel

H. A. Schwartz
Malleable Cast Iron

J. W. Bolton
Gray Cast Iron

All questions must be addressed to the Editor, The Foundry, Penton Building, Cleveland.

GENERAL

Sand Develops Static

We have considerable trouble at times with static electricity in our sandblasting operations. The trouble appears and disappears without apparent cause. We use fine sand about the texture of granulated sugar and clean, dry air at from 85 to 95 pounds pressure.

Your trouble while not universal is fairly common in sandblasting plants. In some places the trouble never is experienced, while in others it appears and disappears, as you say, intermittently without apparent cause or any change in materials or methods. The phenomenon is due partly to the character of the sand, partly to atmospheric condition and partly to the pressure and velocity of the stream. Some sands appear to be more prolific of trouble than others. The usual remedy is to ground the apparatus by running a wire from the nozzle, round the hose to the sand supply chamber and thence to a suitable pipe or other connection leading to the earth.

GRAY IRON

Molds for Sashweights

I am thinking of making some sashweights, and would like some information on a good method for making them.

Sashweights are made in a variety of ways. Probably the simplest method is to use whole patterns submerged halfway in a follow board. Another method is to use a matchplate with half patterns mounted on opposite sides. A third method employs patterns mounted vertically on a plate. The cope is rammed on a board which has round knobs corresponding to the cavities in the drag. Wire loops are placed on the knobs before ramming the cope and these form the eyes for the sashweights.

In several instances the patterns are mounted vertically on a stripping plate molding machine. The height of the patterns above the machine platen may be adjusted to produce any desired length of sashweight. In another method the weights are made in a deep flask one end of which is perforated with holes of the desired sides. The holes are in horizontal rows and the rows are staggered so that one row is not immediately above the other. A plate with the same arrangement of holes is inserted near the opposite end of the flask which serves the purposes of a locator for the other end of the patterns, and later forms the gate. The patterns may be steel pipes mounted on a board. The ends of the pipes are slightly pointed.

In making the mold, the row of patterns is inserted in the lowest holes and the sand rammed in place. Then the second set of patterns is placed in the second row of holes, and sand rammed around them. The first set of patterns is withdrawn and placed in the third row of holes, and that procedure is followed until the mold is finished. The holes at the ends of the flasks are plugged with cores which form the eyes for the weights. The plate near the other end is withdrawn, and a runner box built over the channel formed.

Q & A

Cast Rods for Welding

Have you any information on a suitable composition for cast iron welding rods?

One suggested composition for cast iron welding rods shows the following: Silicon, 3 to 3.5 per cent; total carbon, 3 to 3.5 per cent; manganese, 0.50 to 0.75 per cent; phosphorus, 0.50 to 0.70 per cent, and sulphur, 0.10 per cent. The rods are used for gas welding. In many cases the rods supplied for arc welding cast iron are not made of cast iron, but are low carbon steel or wrought iron rods coated with materials which will give a weld of the desired composition. For example, a Japanese investigator found that wrought iron rods coated with a mixture of graphite and carbide of silicon gave a weld similar in appearance to the cast iron being welded.

STEEL

Castings Are Dirty

We are using a mixture of ganister 5 parts, silica sand 5 parts, silica flour 2½ parts and fire clay 2½ parts for lining our steel ladles. This material does not seem to be satisfactory and seems to be responsible for dirty castings. We shall appreciate a formula for a better steel ladle lining mixture.

Relative cost of different kinds of material in different sections of the country is responsible for a wide variety in formulas for ladle lining material. In many places ganister is used by itself. In others the mixture contains 40 per cent ganister, 40 per cent silica sand and 20 per cent clay. In

other shops the variation ranges between these two extremes. Fire clay and river or beach sand in the proportion of 4 parts of clay to 6 of sand have been used to form a lining mixture for small ladles.

A magnesite lining is required for ladles in which manganese steel is handled. Manganese steel develops a thin elusive slag when brought into contact with a ganister or silica lining and this slag flows with the metal and produces dirty castings. Manganese steel invariably, so far as we know, is poured over the lip of the ladle. Carbon steel slag is comparatively easy to control and besides it is not a by-product of the ladle lining. For that reason we doubt your conclusion that the lining material is responsible for the dirt in the castings. So many factors may be responsible for a dirty casting that we hesitate to specify any one in particular. You did not say that you had investigated all the probable causes and that by a process of elimination you had settled on the ladle lining material. Properly mixed (with the exception of the silica flour which is not necessary) properly applied and properly dried, your present ladle lining mixture should not cause you any trouble check your melting practice and see that it is correct.

Problems in Nonferrous Founding

By Charles Vickers

Wants Brazing Metal

Some time ago we received some formulas for brazing metal from you, but these have been misplaced. Can we prevail upon you to send us the information again?

One formula for a good brazing metal consists of 86.75 per cent copper, 12 per cent zinc, and 1.25 per cent lead. The latter is added to give good machining qualities to flanges, etc. which usually are machined. The brazing alloy specified by the United States government contains 84 to 86 per cent copper, 14 to 16 per cent zinc, 0.06 per cent iron maximum, and 0.30 per cent lead maximum. Your inquiry is not quite clear on whether you desire an alloy for castings to be brazed, or brazing solder. The latter is a quite different alloy and consists mainly of 50 per cent copper and 50 per cent zinc. The alloy is granulated by pouring from a height into a pool of water. The resulting alloy should be cleaned first in a lye dip and then in a bright dip to obtain a bright color.

Q & A

Some Iron Is Present

We are making globe valve bodies and experience some difficulty due to porosity. We are sending you a casting broken through the porous section and you will note there is a distinct line throughout the fractured section. Can you advise us the cause of this line of demarkation which you will see is quite black in color in striking contrast to the rest of the metal. The metal formula is as follows: 87¼ per cent copper, 6¾ per cent tin, 4¼ per cent zinc, 1¾ per cent lead. The above is made of virgin metal.

A qualitative analysis of the dark segregation proves that it has an iron base; the presence of iron being indicated both with ammonium thiocyanate and ferrocyanide of potassium. The amount of material available is so small it is not possible to determine what element is associated with the iron, as the latter is not in the metallic state. We do not know if it is sulphide or oxide, but seeing that virgin metals are used it should not be the former. Although we have no idea of the type of furnace the metal is being melted in, the formation of sulphide is a possibility. All that is needed is sulphur from the fuel, and iron from the gates and other scrap from the cleaning room. We have never noted that iron sulphide segregates to the center of the fracture, it usually makes blackish speckles on the surface of the casting most numerous adjacent to the gates, and also on the runner. The cope side of the runner will be pitted with blackish spots usually considered to be sand. A chemical test, however, will prove their nature.

The source of iron oxide might possibly be the blacking used on the cores and in this connection we note a slight ridge on the cored surface which carries sand particles from the core and looks much as though there had occurred some disturbance of the metal as it filled the mold. Usually when such roughened ridges and slight depressions are seen either on cored or green sand surfaces it means that the molten metal did not lie quietly there. This might come from a hard core or from an unsuitable core wash. Try casting a few of the heats using cores coated with whiting. Use either dry or mixed with molasses water and painted on like plumbago.

In melting see that metal is covered in oil or gas-fired furnaces with a thin slag or glass or brass flux, and if coke-holes are used for melting use charcoal as a cover. In electric furnaces use the same as in the case of oil-fired furnaces, but not too thick. If ladles are used to carry off the metal place in the bottom of each 1½ ounces of phosphor copper for each 100 pounds of metal. In the crucible charge the phosphor-copper first and the copper on top. Too much phosphor-copper will change the color of the castings, and the orange will disappear. When this is noted reduce the amount, or substitute 0.25 per cent of manganese copper, containing 30 per cent manganese, which can be purchased in shot form. The fracture of the metal submitted is poor, and much oxidation is visible under the microscope. It is absolutely necessary to use some deoxidizer. Some bronze alloys do not cast as well as others, and we feel that an alloy costing less that would produce better results might be substituted. You might try an alloy containing 79 per cent copper, 10 per cent zinc, 8 per cent lead, and 3 per cent tin.

Q & A

Rosin Is Core Binder

How is rosin used in cores, and is it a dependable binder?

Rosin is used as a core binder in conjunction with wheat flour, corn flour, or clay. The rosin has no green bond value, and the other materials supply that need. The clay in most cases is supplied through the use of molding sand in the mixture. One mixture suggested for aluminum castings is made from 45 parts sharp sand, 45 parts molding sand, 2 parts powdered rosin, and 1 part flour. Spray with molasses water and bake at not over 325 degrees Fahr. Remove from oven and coat with soapstone. Then return to oven and dry. Another mixture for aluminum castings contains 71 pounds sharp sand, 25 pounds molding sand, and 4 pounds of powdered rosin. Mix in the dry state and then add water to the proper consistency for coremaking. Spray the green cores with molasses water and dry.

A third mixture contains 30 pounds of dry silica sand, 10 pounds of new, dry molding sand, and 2 pounds of pulverized rosin. Mix dry and add water. Green cores are sprayed with molasses water before drying.

Rosin cores are on the soft, weak side, and for that reason may be used for castings where readily collapsible cores are desired to prevent cracking. Rosin also is used in core oils, and may be obtained in the solid or liquid state. The latter is a solution containing up to 60 per cent rosin for use in oils.

BILL

By Pat Dwyer

Looks for Cause of Core Scabs

IF WE are to place any confidence in the reported saying of a certain witty lad, that an optimist is a person who does not care what happens, so long as it does not happen to him, then I am inclined to the opinion that we are all optimists. It may be that the constant torrent of crime news in the papers and the constant portrayal of all kinds of suffering, loss of life by accident and design on the screen, has blunted our sensibilities to the extent that we become callous to all form of suffering.

Recently I read a book dealing with the almost unbelievable suffering of a boat load of men who escaped without food or water from a wrecked steamer and who existed for 24 days before they finally brought up on the island of Samar in the Philippines. Only 14 of the original 36 survived and they succeeded in prolonging their lives only through the revolting and desperate expedient of eating the emaciated remains of two dead comrades.

The story is true and is the personal experience of a marine engineer who always has sailed the lakes with the exception of that one epic voyage in the war days. Despite all the factors which normally should cause me to register grief, compassion and horror I read the book through without the slightest disturbance of the mental or digestive apparatus.

When I asked Bill if he could offer any explanation for this lack of emotion, he dismissed the point as of no importance, but launched out instead into a eulogy of the Philippine Islands. In fact he seemed to think the author of the story should chant a paean of praise and joy for the good fortune that guided him to this fortunate section of paradise.

"Just imagine," he said, "the joy of living in a country where you don't have to work or wear clothes. No rent to pay, no mortgages to meet and no bankers to refuse you a loan. No radio crooners and no announcers, aggravating birds about as necessary as the fifth wheel on a coach and about as pleasant to the ear as the remaining four wheels, ungreased.

"When you're hungry you go out and knock down a coconut. When you are dry, ditto. When you need a little piece of change you go out and knock down two coconuts and sell 'em. By day you sit under the shade of a palm tree sucking sugar cane juice through a quill and by night you make a nest in the grass and go to sleep.

"Where did I get all that dope? Well, I'll tell you. I got that impression from some lines I read many years ago and although knowledge gained in later years has shown me the impression is all wet, I still like to call up the old vision now and again: *In the smiling isle of Jolo where the natives lay the foe low,*

What Is Home Without a Radio?

with a bludgeon called a bolo and a hard and hideous grin; back through centuries unnumbered, people fished and fought and slumbered, absolutely unimcumbered save by their surrounding skin!

"All that aboriginal simplicity is pretty much a thing of the past, at least in Luzon and Mindano, the largest and most populous of the thousands of islands making up the long group that extends from the southern tip of Asia to the island of Borneo. People now are killed and maimed and crippled by all the civilized agencies instead of by the primitive—but at the same time exceedingly effective—bolo.

"To be strictly truthful and accurate the Philippines seem to present all the usual hazards to life and limb and in addition present a few extra hazards usually associated with tropic and semitropic territories. Can you imagine a lizard knocking a line man off a pole?"

"No," I said, skeptically. "How does the reptile do it? Does it push the man with a front foot, bang him with its tail or simply breathe its fetid breath down the back of his neck and cause him to fall over backward with a loud cry of the most piercing agony?"

"Well," Bill said. "Believe it or not, but here is a story that drifted out of the G. E. headquarters in Schenectady recently.

Designing engineers endeavored to take into account all kinds of conditions and predicaments that might cause trouble in the operation of electrical equipment, but they never gave a thought to lizards—and so trouble has developed in the Philippine Islands.

At least one lineman there found himself on the ground, knocked off a pole by a shock received from the transformer he had disconnected from the power supply. A lizard caused his fall, but the lizard will not repeat. Its shocking experiment was fatal—to it.

A cut out is mounted on the cross arm adjacent to each pole type transformer so that it may be disconnected from the power supply. The cut out is in a small, weather proof box with a hole in the bottom for the drainage of any condensed moisture. Heavy duty cartridge type fuses are mounted in the box for disconnecting and connecting the circuits.

Lizards formerly sought holes and crevices in the bark of trees for their afternoon siestas. With the coming of progress typified by wooden poles the lizards inspected, approved, and migrated into the cut out boxes.

Came an unsuspecting lineman. The lizard family was absent when the man opened the cut out and made the transformer safe for the work he was about to do. One of the reptiles strolled back for the regular afternoon nap. It crawled into the cut out box, stretched and yawned as a preliminary to curling up in blissful sumber. It attained the blissful slumber, but the slumber was perpetual. The yawnful stretch carried the tail upward where it rested on the upper contact. In the meantime the chin rested on the lower contact. The circuit was completed, the life of the lizard was completed and the lineman was electrically precipitated to the ground.

From this time forward cut outs in the Philippines and other lizard populated countries will have small wire screens across the drainage holes. Lizards have been served with eviction notices and hereafter they will have to be satisfied with the old time holes and crevices in the bark of trees.

"It seems to me," I said, "that if a person really was seeking trouble he could find a supply without traveling as far as the Philippine Islands."

"Trouble?" said Bill. "In one shape or another it is with us always. I had an inquiry the other day from a citizen whose cores caused no trou-

ble in castings up to ¾-inch thickness. On thicker castings they scab, with or without a core wash. He wrote that his core sand mixture contains 2 parts coarse sand and 1 part fine sand. This is screened, then cut over to incorporate a pitch binder to the extent of 5 per cent and then screened again. An oil binder is added in the proportion of 1 part oil to 60 parts sand, followed by water in the proportion of 1 part water to 6 parts sand. The mixture then is put through a fine screen and is considered ready for use. The green cores are sprayed with a water soluble binder before they are placed in the oven. He was at a loss to understand why the heavy castings showed scabbed surfaces on the core side.

"Taking the inquiry as it appeared, I also was at a loss to suggest any remedy for the trouble. Certainly increased thickness of metal alone, will not cause a core to scab, if that same core—or rather, one similar to it in all respects—did not cause scabs in a thinner casting. All I could do was to hazard a guess at the probable cause. It is only logical to assume that some unknown factor is present.

"Reference to the addition of water in the proportion of 1 part water to 6 parts sand, led me to wonder if the writer had not been misinformed on other items. One part to 6 is a little better than 16 per cent. Sand containing 16 per cent water could not be rammed in a corebox. Further addition of oil would convert the mass into mud.

"Reference to coarse sand and fine sand is not sufficiently definite, since he did not specify whether both are core sands, molding sands, or one of each. Most important of all, he did not furnish any particulars of the core, size, shape, reinforcement, vents, and the position it occupies in the mold. All these factors exert an influence on the behavior of the core when it comes into contact with the molten iron, and are necessary to any person attempting a long distance foundry diagnosis.

"If the two cores, one for the heavy and one for the light casting, are made, dried and used under exactly similar conditions and further, if one core causes the casting to scab while the other does not, I cannot offer any solution for the problem.

"However, basing my opinion upon an extended experience, I feel satisfied that in some detail the practice of producing one core differs from the practice pursued in producing the other. As a foundation point on which to start any investigation, consider the fact that a core scabs for only one reason. Gas or steam generated near the surface and denied an exit through the sand in a legitimate direction, develops sufficient pressure to lift part of the crust or skin on the core, and thus escape through the molten metal. Sometimes all the rebellious gas does not escape in this manner, but remains trapped in the iron and the net result is a honeycomb structure in the interior of the casting in addition to a scabbed surface on the outside.

"The next step in the investigation is to determine what factor in the manipulation or mixture of the sand is responsible for a condition which prevents the proper escape of the gas generated at the time the sand is brought into contact with the metal. An open,permeable core will allow all the gas to escape readily through the vents provided for the purpose. That type of core will prevent the building up of any back pressure.

"In this connection it is pertinent to point out that the area of the core prints must be taken into consideration. A core in which the gas may escape through a wide expanse of core print, conceivably might build up a back pressure if the core prints were to be restricted to a considerable extent.

"The underlying cause of scabbed cores is lack of sufficient permeability in the sand, and this lack of permeability may be due to an excessive amount of binder, to hard ramming, or to insufficient drying, Of course in extreme instances two or even three of these factors may be present in the same core.

"The ideal core is one made from sharp sand bonded with a minimum amount of binder and then dried almost to the point of burning. This core presents a maximum permeability since all the binding agent has been removed with the exception of a thin film at the contact points of the sand grains. In like manner all the moisture has been removed.

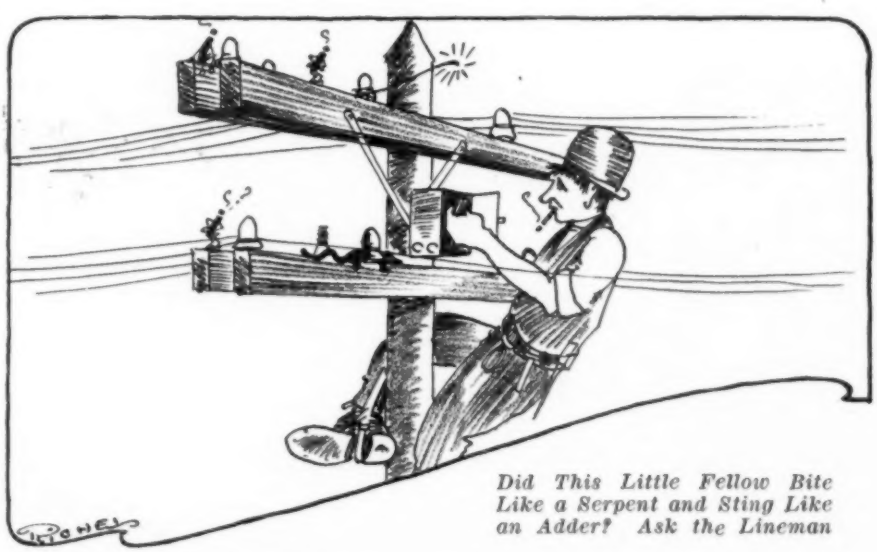
Some Times He Sits and Thinks and Some Times He Just Sits

"Moisture in a core presents two hazards. It helps to fill the interstices between the sand grains and thus prevents the free passage of the gas. Also, and this is the principal hazard, it is converted to steam by the heat of the molten metal, and this additional volume of gas must escape either through legitimate or illegitimate channels.

"As a practical solution for the problem I suggested that he cut down on the amount of binder, reduce the amount of fine sand (if it is molding sand) fill the center of the large cores with coke, provide liberal vent openings, and see that the cores are dried thoroughly.

"To test this last feature I suggested that he break one open after it leaves the oven. He may be surprised to find that the center of the area in contact with the core plate is not nearly as dry as he was led to believe. Instead of spraying the cores with a core wash before they go into the oven, and then coating them with a second wash after they come out, thus inflicting upon them a hard double skin or crust, he will find that it is sufficient for all ordinary purposes to spray them before they go into the oven."

On certain cores a considerable degree of skill is required to black them while in a green state. That accounts for the fact that the general practice was to black them with a brush or swab after they were dried, before the spray came into use.



Did This Little Fellow Bite Like a Serpent and Sting Like an Adder? Ask the Lineman

Arranges Details for Foundry Congress

At a meeting held in Paris, France, on Oct. 15, the executive committee of the Association Technique de Fonderie agreed on the principal items of the program for the Fourth International Foundrymen's congress, which is to be held in France in September, 1932.

Before the congress, which will be opened in Paris on Sept. 14, two short tours will be arranged. One for the American delegates will take place in the region of Havre, Rouen and Caen. The American delegation will land in France at the port of Havre, which will be visited. Rouen is one of the most interesting cities of France and contains many monuments and mediaeval architecture. At Caen opportunity will be given to visit a modern iron and steel works, and there are also interesting foundries in the region. This tour will be of about three days' duration. The second short tour will be arranged for foundrymen coming from Great Britain and countries in northern Europe, and will be staged in the industrial region of the north of France.

On Sept. 13 an informal reception will be organized in Paris so that the foundrymen from different countries may meet and become acquainted. The congress itself will be held from Sept. 14 to 17, with one technical session on the morning of each day and an official closing session on the afternoon of Saturday, Sept. 17. On the afternoons of the previous days visits will be organized to the foundry exhibition and to various works in the Paris district. There will also be a number of receptions, details of which will be published later. The official banquet will be held on the evening of Sept. 17, and will be followed by a dance organized by the Association of Old Fellows of the Ecole Superieure de Fonderie. On Sunday, Sept. 18, an excursion will be arranged in one of the country districts in Paris, probably to Rambouillet where the summer residence of the president of the French Republic is located.

The post-convention tours will start on Monday, Sept. 19, with a choice of two tours; one in the Ardennes district, which is a foundry center in France containing a large number of small, but efficient foundries and a smaller number of more important works. This tour will take in Nancy, which is the center of the eastern industrial district of France, and will end on Sept. 23.

The second tour will be directed towards the center of France, then to the Alps region with a possible extension down to Nice and the French Riviera. Those visitors taking this tour will visit foundries at Bourges, Le Creusot, the seat of the Schneider works, Lyon, Saint-Etienne, Ugine, which is located in one of the most beautiful districts in France, and Grenoble.

To Hold Examinations

The United States civil service commission has announced competitive examinations for associate physicist in sound, or any other specialized branch of physics and assistant physicist in any specialized branch of physics. Applications for the positions must be filled with the commission at Washington, not later than Feb. 2, 1932.

A Correction

THE FOUNDRY regrets that through an error the micrographs appearing in the Dec. 15, 1931, issue at the bottom of page 33 in the article entitled "What Oxidized Scrap Can Do To Iron," by Garnet Phillips, were reversed. To clear up any misunderstanding they are shown in the correct order in the accompanying illustration. Chilling of the iron mentioned in the article was not due to chromium as analyses did not reveal its presence in lots *A* and *B* of the scrap iron, nor in specimens *A* and *B*. The analysis of specimen *A* in addition to the information given on page 34 showed 1.84 per cent graphite and 1.44 per cent combined carbon. Specimen *B* showed 0.23 per cent graphite and 3.07 per cent combined carbon.

Steel Founders Vote on Specifications

(Concluded from Page 49)

come back to the foundry through the combination of steel castings in welded structures. Further development of alloy cast steel, according to Mr. Ritter, will be an added incentive for the use of steel castings. However, welding has a field without any doubt and the speaker cited several advantages of welded structures, including a saving in weight, which in some cases has permitted assembly at the plant rather than in the field.

While the majority of members present, in reporting on the business situation, anticipate little improvement during the early part of the first quarter of 1932, several were rather optimistic regarding an increased demand for steel castings. One member, who recently made an extended trip through the New England states, reported the development of a number of new machines which will undoubtedly make considerable equipment now used by the textile industry obsolete. Several members reported substantial increase in inquiries and one large manufacturer of equipment reported a larger number of inquiries during the past few weeks than in the previous five months.

A combined meeting of the large and small castings divisions was held in the afternoon, with T. H. Harvey, Ohio Steel Foundry Co., Lima, O., presiding.

The Wellman Engineering Co., Cleveland, has purchased the clamshell bucket and heavy-duty trailer business of the G. H. Williams Co., Erie, Pa.

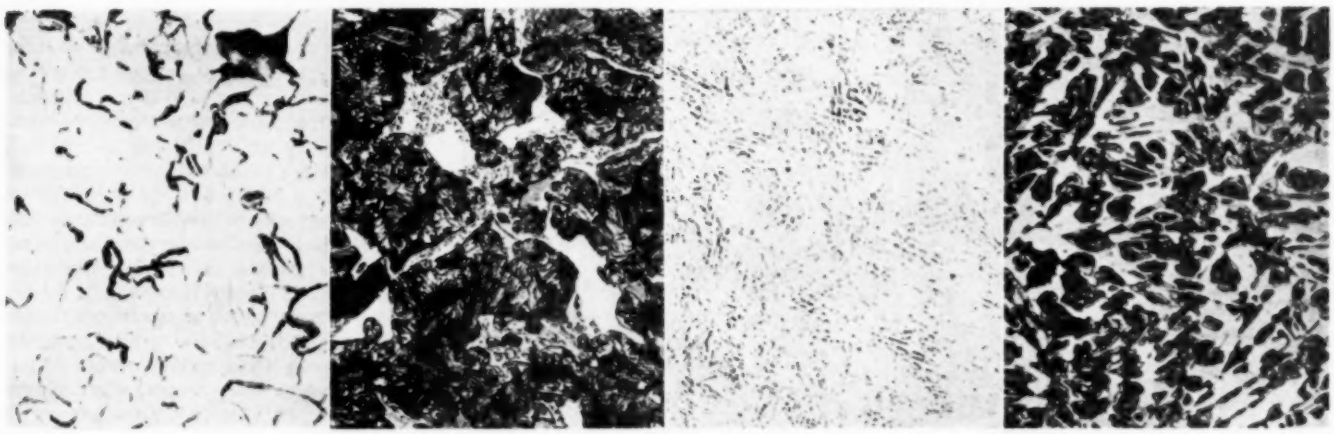


Fig. 1—Specimen A, Unetched, 100 Diameters. Fig. 2—Specimen A, Etched with 2 Per Cent Nital, 250 Diameters. Fig. 3—Specimen B, Unetched, 100 Diameters. Fig. 4—Specimen B, Etched with 2 Per Cent Nital, 250 Diameters

The FOUNDRY Family Photograph Album

Upper Left

F. A. MELMOTH
Detroit Steel Casting Co.
Detroit

Upper Right

J. L. CUMMINGS
Laclede Christy Clay Products Co.
St. Louis

Lower Left

C. E. MITCHELL
Gray Iron Institute
Cleveland

Lower Right

V. A. CROSBY
Studebaker Corp.
South Bend, Ind.

DAN M. AVEY
Editor

The Shakeout

FRANK G. STEINEBACH
Managing Editor

PAT DWYER
Engineering Editor

EDWIN BREMER
Metallurgical Editor

CHARLES VICKERS
Nonferrous Editor

NORMAN F. HINDLE
Assistant Editor

¶Disputes Depression

A FOUNDRYMAN recognized throughout the industry for his business acumen, sends a news story which says in part:

> "Seiberling turned a 1930 loss $1,282,098 into a net 1931 profit $500,347. . . . How did he do it? . . .
>
> We have, fortunately, Seiberling's own answer: "This change has been brought about by the introduction of our new . . . tire, which was sold at the highest price of any tire on the market, also by our complete withdrawal from the unprofitable original equipment business of automobile manufacturers, and a substantial decrease in general overhead and operating expenses."

The new product plus a price with profit is the answer. Lacking the first of these factors, is it not sound business for any foundryman to base his sales upon the second?

¶Repel the Gas Attack

PERIODS of industrial and financial depression breed an unnatural tenseness. This is shown graphically by abnormal actions falsely justified because of strained conditions, which in other times would not meet with the approval of even a small portion of the individual companies making up our vast industrial structure. Rumors run rampant until the ugly finger of suspicion points unjustly toward even those companies and individuals that are bending every effort in the struggle to keep a particular industry from practicing destructive tactics.

WITH falling commodity prices, enormous pressure is coupled with unfair methods on the part of some purchasers. The strong desire to keep the plant in operation and the employes at work at all costs, leads some manufacturers of castings to throw caution and good business sense to the winds. Some have gone after and taken business at prices below even the actual cost of production. Such price cutting cannot be justified on any score, and the individual engaging in such practices is a menace, not only to the fortunes of his own company, but to the industry as a whole. Business must be conducted for a profit to avoid ruin.

WITHOUT discounting in the least the peril created by the price cutter, a recent development points to an even greater danger to the successful development of the industry when the depression passes and business activity again is on the ascendancy. Rumors have appeared, which, if allowed to continue, may destroy confidence in existing agencies of progress. These are the false accusations that certain members of the various foundry trade associations engage in unfair practices and have indulged in irresponsible price cutting tactics to secure business. For several years, men in the three ferrous branches of the foundry industry have labored faithfully in the development of three strong trade associations. The unselfishness of these men has been of inestimable value, to members and nonmembers alike. Much has been accomplished, including the adoption of cost systems containing the best methods developed in the industry. Research undertaken by the various groups has been a vital factor in strengthening markets. Standards of practice have been set up and information of vital importance in the stabilization of the industry has been exchanged.

THE trade associations today are carrying on, serving the industry in a manner never before attempted and leading toward a greater future for the castings manufacturer. More than ever, members, with possibly a few exceptions, appreciate the service that the trade association has made possible. These men are not going to be guilty of practices which will wreck the splendid accomplishments and the future possibilities of the groups. Now is a poor time for rumors—devastating stories regarding trade associations, its officers or individual members. Stop the gas attack.

¶Work Is Distributed

FIRST reports of the safety campaign recently launched by the Ohio Foundries association, Cleveland, show progress toward the reduction of accidents and also indicate interesting information on employment in Ohio foundries. Data from 61 of the 180 plants taking part in the safety movement show 61 foundries employed a total of 8284 foundry workmen during November, with a total of 694,164 man hours. An analysis of these figures shows that an average of 135 men were employed by each plant, a high average in the face of the present business situation. While during the month each of the men worked only approximately 83 hours on the average, the data shows that Ohio foundries are distributing available work to many individuals.

Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

ERIC WISBRUN, formerly research engineer, Perfect Circle Co., Newcastle, Ind., has been placed in charge of the chemical and physical laboratory of the Liberty Foundries Co., Rockford, Ill. Mr. Wisbrun received his technical education at the Bergakademie in Freiberg, Saxony, Germany, and specialized in foundry engineering at the Bergakademie-Clausthal. Before coming to the United States he managed the foundry of Otto Spaleck, Greiz, Germany, manufacturer of thin section castings for looms and other textile machinery as well as castings for vises and jobbing work. His practical experience also has covered various types of work in gray iron and malleable foundries, steel mills, blast furnaces and coke ovens, chemical and combustion laboratories, boiler and machine shops. Since 1926 he has been connected with the Universal Sand Throwing Machine Co., Cleveland, as sales and service engineer of sand conditioning machines, and the Perfect Circle Co. of Newcastle.

J. P. Ferguson, Reading Steel Casting Co., Reading, Pa., has been elected treasurer, Exhibitors' Committee Industrial and Power Shows Inc., New York.

Hobart S. Johnson, formerly vice president, Gisholt Machine Co., Madison, Wis., has been elected president to succeed his brother, Carl A. Johnson, who died recently.

Samuel J. Hopper, until recently works manager, American Seeding Machine Co., Springfield, O., has been appointed general works manager, Newman Mfg. Co., Cincinnati, maker of ornamental bronze and steel work.

James J. Ryan, previously identified with Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed professor in mechanical engineering, machine design section, College of Engineering and Agriculture, University of Minnesota, Minneapolis.

T. S. Hammond, Whiting Corp., Harvey, Ill., recently was appointed a brigadier general and placed in command of the 65th Infantry Brigade, Illinois National Guard. Previous to the recent appointment, General Hammond held the rank of colonel in command of the 124th Field Artillery, Illinois National Guard. General Hammond has been active in military work since 1915. He served at the Mexican border in 1916 and in France from November, 1917 to January, 1919. In 1918 he was decorated with the insignia of the French Legion of Honor by General Gouraud of France.

Stanley Apgar, foundry superintendent, High Bridge, N. J., plant, Taylor-Wharton Iron & Steel Co., has also been placed in charge of the company's foundry at Easton, Pa. Mr. Apgar began his career as an apprentice patternmaker with the Taylor-Wharton company at High Bridge in 1903 and continued to work at that trade until 1912 when he was appointed pattern inspector. He served in that capacity until 1915 when he entered the foundry as foundry foreman. In 1917 he was appointed foundry superintendent and in November, 1930, he was appointed foundry superintendent of the Easton, Pa., plant. He continued until recently when he was appointed superintendent of both plants.

John E. Barkle has been appointed general manager, South Philadelphia, works, Essington, Pa., for Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. He has been with the Westinghouse company for 30 years and in 1916 was made superintendent of a plant which the company had erected at Pittsburgh for the manufacture of munitions. When the first electric passenger locomotives were delivered to the Chicago, Milwaukee & St. Paul railroad in 1919, Mr. Barkle was placed in charge of the erection activity with headquarters in Montana. Later he was placed in charge of all the district office service shops as general superintendent, and in 1926 was made superintendent of manufacturing of all generating apparatus at East Pittsburgh, Pa. In December, 1929, Mr. Barkle was appointed works manager of the South Philadelphia works, which position he held until his recent appointment as general manager.

New England Founders Discuss Gates

The regular monthly meeting of the New England Foundrymen's association was held at the Engineers' club, Boston, Dec. 9. The meeting which was attended by 48 members was opened by President Anthony, and upon motion Charles A. Reed, Rogers Brown-Lavino Co., Boston, was appointed chairman of the entertainment committee for the annual meeting. In addition three past presidents of the association were appointed as a committee to submit a list of nominees for the coming year. The committee includes E. F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass.; R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston, and C. F. Miller, Universal Winding Co., Providence, R. I. Following the business meeting Arthur J. Tuscany, Gray Iron institute, Cleveland, addressed the members on "Soft Iron." Following the address the meeting was turned over to C. F. Miller who led a round table discussion on gates and risers.

Nonferrous Foundrymen Hold Meeting

A meeting of the Connecticut Nonferrous Foundrymen's association, held Dec. 7 at the Hotel Garde, New Haven, Conn., was attended by about 50 members and guests who heard F. J. Tobias, Newton Die Casting Corp., New Haven, present an illustrated lecture on "Die Casting Art, Past, Present, and Future." Election of officers was held, and the 1931 officers were re-elected in recognition of their splendid work during the past year. These include President C. H. Blanchard, Reading Steel Casting Co., Pratt & Cady division, Hartford, and Secretary C. D. Elliott, Wilcox, Crittenden Co. Inc., Middletown, Conn. The meeting night of the association has been changed to the first Monday of the month, and the next meeting is scheduled for Jan. 4 at the Hotel Garde.

Costs Serve Industry

Standard costs serve business and industry as a guide to future action according to G. C. Harrison, Chicago, who spoke at the annual fall meeting of the Taylor society held at Hotel Pennsylvania, New York, Dec. 3. Those costs are being used to increase sales volume, but due to inadequate accounting, many sales managers do not know the value in terms of increased profits of $100 of increased sales. Mr. Harrison advocated the education of executives on the possibilities and advantages of scientific standard costing, and the placing of the position of accountants on a higher plane in the business field.

Elected President

At the annual meeting of the Malleable club held at the Blatz hotel, Milwaukee, on Dec. 8, Prof. Scott Mackay, University of Wisconsin, Madison, Wis., was elected president for 1932. M. A. Harder, Lake Side Malleable Castings Co., Racine, Wis., was elected secretary-treasurer.

OBITUARY

Clarence H. Howard, 68, for 25 years president for the Commonwealth Steel Co., St. Louis, died Dec. 7. He was born at Centralia, Ill., in 1863, and after graduating from Washington university worked four years as an apprentice machinist at North Platte, Neb. In 1886 he became foreman, later general foreman, of the Missouri Pacific shops and then superintendent of the Missouri Car & Foundry Co. In 1890 he became general manager, St. Charles Car Co., and in 1891 he was made secretary of the Safety Car Heating & Lighting Co. with office in St. Louis. He remained 8 years and in 1899 became vice president of Shickle, Harrison & Howard Steel Co., St. Louis, later known as Leighton & Howard Steel Co. In 1902 this companw was absorbed by American Steel Foundries and Mr. Howard was made a vice president. He was president of Commonwealth Steel Co. from 1904 to 1929 and when it was merged with General Steel Castings Corp., Eddystone, Pa., and Granite City, Ill., he was made chairman of the board of the latter. He resigned in April, 1931.

Raymond B. Gilmore, 34, chief ceramic engineer, North American Refractories Co., Cleveland, died at Curwensville, Pa., Dec. 11.

Frederick S. Jordan, sales manager nickel department, International Nickel Co. Inc., New York, died at his home Dec. 16.

W. H. Prescott, director of the Osborn Mfg. Co., Cleveland, the Reliance Electric Co., Cleveland, and formerly a director of the Central Alloy Steel Co. before it merged with Republic Steel Corp., died Dec. 14 at his home in Cleveland.

George S. Crosby, one of the early manufacturers of malleable iron toys, died at his home in Simonsville, Vt., recently. Mr. Crosby was born in 1848 at Easton, Pa., on what is now the campus of Lafayette College. After becoming a skilled foundryman, he started the malleable iron toy industry in Bridgeport, Conn., and later established a factory in Brooklyn, which was moved to Buffalo in 1889 Mr. Crosby retired in 1918.

Frank Moore, organizer and for many years president of the Pittsburgh Malleable Iron Co., Pittsburgh and the Zanesville Malleable Iron Co., Zanesville,O., died recently at his home in Pittsburgh. Mr. Moore was associated for many years with the Westinghouse Air Brake Co., Wilmerding, Pa., and was one of the best known railroad equipment engineers in the country, being responsible for many inventions, and was given equal credit with Westinghouse for the perfection of the air-brake equalizing valve.

DIRECTORY OF FOUNDRY ASSOCIATIONS

American Foundrymen's Association

President, E. H. Ballard, General Electric Co., West Lynn, Mass.; executive secretary-treasurer, C. E. Hoyt, 222 West Adams street, Chicago; technical secretary, R. E. Kennedy, 222 West Adams street, Chicago.

Associated Brass Founders of New England

President, George W. Thornburg, Crescent Park Brass Foundry, Waltham, Mass.; secretary, Herbert H. Klein, Pennsylvania Foundry Supply Co., 310 Congress street, Boston. Meetings the fourth Wednesday of each month at the Engineers' club, Boston.

The Buffalo Foundrymen

President, J. McArthur, Washington Iron Works; secretary, W. J. Wark, E. J. Woodison Co., 140 Chandler street. Meetings each month at club rooms, 140 Chandler street.

Central Illinois Foundrymen's Club

President, H. M. Hire, Hire Foundry Co., Peoria, Ill.; secretary, Franklin Whitehead, The Meadows Mfg. Co., Bloomington, Ill.

Chicago Foundrymen's Club

President, L. E. Gilmore, Crane Co., Chicago; secretary, Albert N. Wallin, S. Obermayer Co., 2563 West Eighteenth street. Meetings first Thursday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association

President, Carl S. Neumann, Union Mfg. Co., New Britain, Conn.; secretary, Charles S. Parker, Charles Parker Co., Meriden, Conn. Meetings are on second Friday of each month in various parts of the state.

Connecticut Nonferrous Foundrymen's Association

President, C. H. Blanchard, Reading Steel Casting Co., Pratt & Cady division, Hartford, Conn.; secretary, C. D. Elliott, Wilcox, Crittenden Co. Inc., Middletown, Conn. Meetings held the first Monday of each month at place to be named. Recent meetings have been held at Hotel Garde, New Haven, Conn.

Detroit Foundrymen's Association

President, James L. Mahon, American Car & Foundry Co.; secretary, Neil I. McArthur, Great Lakes Foundry Sand Co., 2100 Penobscott building, Detroit. Meetings third Thursday in each month, except December, June, July and August at Ft. Shelby Hotel.

East Bay Foundrymen's Association

Secretary, O. R. Moller, Electric Steel Foundry Co. Inc., 1328 Second street, Berkeley, Calif.

Electric Steel Founders' Research Group

Director, R. A. Bull, Central Office, 541 Diversey Parkway, Chicago.

Gray Iron Institute

President, A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.; manager, Arthur J. Tuscany, Terminal Tower building, Cleveland.

Malleable Iron Research Institute

President, R. R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill.; secretary, Robert E. Belt, Union Trust building, Cleveland.

Metropolitan Brass Founders' Association

President, William Ember, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary, William E. Paulson, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 2 Park avenue, New York.

New Jersey Foundrymen's Association

President, W. H. Mantz Atlas Foundry Co., Irvington, N. J.; secretary, G. W. Hannay, Barnett Foundry & Machine Co., Irvington, N. J. Meeting called by president. Scheduled meeting dates: Oct. 28, Dec. 2, Jan. 27, 1932, March 23, 1932, May 25, 1932.

New England Foundrymen's Association

President, Luther J. Anthony, Glenwood Range Co., Taunton, Mass.; secretary, Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass. Meetings held the second Wednesday of each month excepting July and August at the Engineers club, 2 Commonwealth avenue, Boston. Outings usually are held in the months mentioned.

Ohio Foundries Association Inc.

President, A. H. Kramer, Advance Foundry Co., Dayton, O.; secretary, Robert Hoierman, 418 Penton building, Cleveland.

Pacific Coast Founders Association

President, Charles J. P. Hoehn, Enterprise Foundry Co., 2902 Nineteenth street, San Francisco; manager, S. M. Truitt, Room 320 Rialto building, San Francisco.

Philadelphia Foundrymen's Association

President, J. B. Greenstreet, Olney Foundry Co., Philadelphia; secretary, Earl Sparks, 1623 Sansom street, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Pittsburgh Foundrymen's Association

President, H. F. Siefert, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; secretary-treasurer, William J. Brant, Wm. J. Brant, Bessemer building, Pittsburgh. Meetings on the third Monday of the month, except in July and August at Fort Pitt hotel.

Quad-City Foundrymen's Association

President, E. A. Gullberg, Union Malleable Iron Works, East Moline, Ill.; secretary-treasurer, Stanley Brah. Meetings the third Monday of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

St. Louis District Foundrymen's Club

President, W. C. Raithel, Century Electric Co., St. Louis; secretary-treasurer, Leo J. Filstead, John C. Kupferle Foundry Co., St. Louis. Meetings the fourth Thursday of the month at 6:30 p. m., at the American Annex hotel, Sixth and Market streets, St. Louis.

Southern Metal Trades Association

President, John S. Schofield, J. S. Schofield's Sons Co., Macon, Ga.; secretary, W. E. Dunn Jr., Hurt building, Atlanta, Ga.

Steel Castings Development Bureau

Research Director, George Batty, 500 Stock Exchange building, Philadelphia.

Steel Founders' Society of America

President, W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.; managing director, G. P. Rogers, Graybar building, New York.

Tri-City Technical Council

Chairman, C. F. Scherer, Davenport Machine & Foundry Co., Davenport, Iowa; secretary, E. C. Xander, assistant secretary, Tri-City Manufacturers association, Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association

President, William Hoppenjans, The Star Foundry Co., 221 Main avenue, Covington, Ky.; secretary, C. C. Erhart, Chris Erhart Foundry Co., Cincinnati. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association

President, Frederick Christensen, R. R. Howell & Co., Minneapolis; secretary-treasurer, C. E. Langdon, 3849 Lyndale avenue, south, Minneapolis. Meeting third Wednesday of each month at Athletic club.

Washington Foundrymen's Club

President, Rex L. Alexander, Olympic Steel Works, Seattle; secretary, Edward C. Gustin, 3716 Grayson street, Seattle. Meetings second and fourth Tuesdays of each month at the Elks Temple, Fourth avenue and Spring street.

Western Foundrymen's Association

President, H. T. Hornsby, Joplin, Mo.; secretary, E. L. Graham, Acme Foundry & Machine Co., Coffeyville, Kans.

Wisconsin Gray Iron Foundry Group

Secretary, W. F. Bornfleth, Cutler-Hammer Inc., Foundry Division, Milwaukee. Meetings on second Wednesday of each month at Hotel Schroeder, Milwaukee.

Reader's Comment

Editor's Note—Material appearing under this head does not necessarily reflect the opinion of THE FOUNDRY or of its editors.

Advocates Name Change

TO THE EDITORS:

Your editorial comment on Mr. Ballard's suggestion to the Foundry Equipment Manufacturers association to eliminate the term *sandblast*, stirred memories of days when demonstration of the sandblast to a prospective purchaser was in a deserted corner of the yard with observers in full retreat from the base of operations.

Mr. Ballard speaks with authority for his personal experience goes back (in the writer's activities) to when *sandblasting* earned its stigma, then well deserved. He has seen the progress of modernizing equipment, ventilation and abrasives that make the old conditions but a disagreeable memory he seeks to efface.

His suggestion is timely and to the right source. Equipment manufacturers mainly are responsible for continued use of the term. They have fostered it in literature, advertising and correspondence, neglecting opportunity to discard it when new equipment and new abrasives were rapidly abolishing operating conditions that caused the early stigma.

Regulatory laws are due more to conditions that induced them than to the name. *Blasting* as a process carries no stigma. It is conditions permitted in its operation that hurt. The word *sand* immediately suggests dust which is the real cause of objections. Its elimination alone would go far to remove the bad name and be equally beneficial to producers of sand as well as other abrasives and the equipment manufacturers.

The real burden seems to be on the foundrymen to consider results, rather than first cost the desired end. To put into the initial installation the expense he is later put to by legal regulation, for which there would then be no need. Returns on his investment will then more than correspondingly increase.

A new name inadequate to describe the process will not alone change condition or laws. Nor should manufacturers be expected to forego cumulative goodwill and prestige for well understood equipment that it would entail.

The word *blasting* seems necessary to describe that method of cleaning. Mr. Ballard suggests *pressure-cleaning*. Air hammers and air operated knock-out devices are that, to the extent that they all use the same motive force. In fact, all might be used for cleaning the same casting with different equipment and different treatment for each.

What is to differentiate between blasting as now so universally understood and use of hammers, jarring or new pressure processes to come? Manufacturers of blasting equipment will undoubtedly object to the elimination of that term, and rightfully so, if the elimination allows confusion with competitive processes that are in use.

Sandblasting and metalblasting are too well understood, too distinct and too competitive today to admit of a common name. Difficulty is to coin a single word, acceptable to conflicting interests, descriptive of the various kinds of blasting. Will metal abrasive producers be willing, in any change made, to have their products classsed in a general term that may also suggest sand? Sand producers will object to *metal-blasting* for it infers elimination of even a suggestion of sand. While the use of metal abrasives is constantly progressing, sandblasting will be with the industry when its interests are all in other hands, which makes Mr. Ballard's contribution the more worthy of attention.

Solution lies, the writer believes, in retention of the term *blasting* as descriptive of the process itself. When compounded into abrasive-blasting it covers generally that method of cleaning. Metal-blasting or mineral-blasting indicates the type of abrasives used. These terms accomplish the desired end. They are no more cumbersome nor complicated than description of the product of the foundry itself which is all castings but must be coupled with gray iron, malleable or steel to indicate the kind of casting.

Admitting of ready interchange as usage requires, these terms describe, either generally or specifically, the process used without resulting confusion. In some one of them, and without conflict of interest, equipment manufacturer, abrasive producer and the user will find the right word to adequately express and convey his meaning eliminating sand to conjure up conditions that gave the dog his bad name.

Concerted effort by all interests in the use of such terms to the exclusion of sand, aided and abetted by THE FOUNDRY and the Associated Business Papers undoubtedly can accomplish the change in comparatively short time.

There is ample time for consideration, and yet to put it over, at the common meeting ground, the next A. F. A. convention. It would be a graceful recognition during Mr. Ballard's incumbency of his efforts to purge the industry of a constant suggestive of conditions, that in modern practice, even when blasting with sand no longer exist.

As we come out of the business depression, let us leave with it this depressing stigma.

H. D. Gates,
Buffalo.

Steel Castings Lead

(*Concluded from Page* 43)

the belief that every material and process has its proper place in the economic scheme, and hence are able to discuss problems involving choice of metals and methods of construction with impartiality. Consequently, if welding is the economical and scientific answer, they will not hesitate to say so. They realize that overselling a product will create an unstable situation which in time will be corrected and the business will ultimately go to that material or process producing the most satisfactory product at the lowest cost.

Study Marketing

Dr. H. H. Sheldon, H. A. Morse, L. W. Hutchins, and Dr. W. H. Easton, recently have organized a new service organization to facilitate the marketing of industrial products. The company with offices at 191 West Tenth street, New York, will be known as Sheldon, Morse, Hutchins & Easton. This group will give special attention to economic problems arising in connection with scientific research in the application and market for products.

Describes Finishes

The Aluminum Co. of America, Pittsburgh, recently published an 8-page bulletin entitled "Specifications for Architectural Finishes Applied to Aluminum Alloy Sand Castings." Information is presented on the different types of finish and the method of obtaining them. The finishes listed are: As cast; sandblasted; deplated; high lighted; wire brush; satin, and oxidized high light. Data also is given on cleaning after finishing, and protective coatings.

Issues Specification

The Vanadium Corp. of America, New York, recently issued a specification for high test, carbon vanadium cast steel for locomotive and other castings which supersedes one issued in 1923. The specification covers manufacture, chemical properties and tests, physical properties and tests, and workmanship and finish.

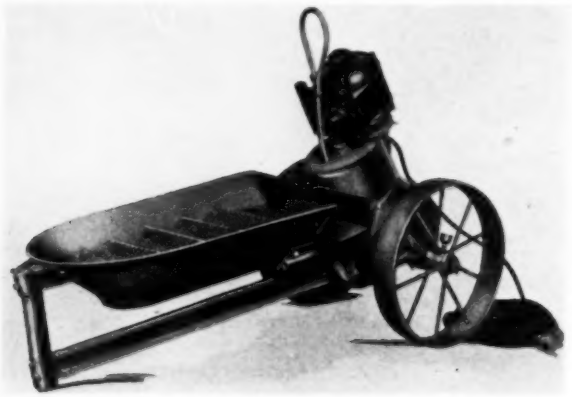
Moves District Office

The New England office of Werner G. Smith Co., Cleveland, has been removed from Boston to Springfield, Mass. The address of this office is the Werner G. Smith Co., Stearns building, 293 Bridge street, Springfield, Mass.

Portable Unit Prepares Foundry Sands

Beardsley & Piper Co., Chicago, has developed a portable sand screening, blending, aerating and throwing unit designed to prepare heap, facing and core sand and for odd sand conditioning jobs in the foundry.

The operation of the conditioning device is simple. Sand is shoveled into the ridged screen and the reciprocating motion breaks, aerates and screens the sand and drops it into the hopper below. From there it is conveyed by gravity and the reciprocating motion to the rotor housing where a series of long wearing blades or paddles revolving at high speed cut, mix and blend the sand and expel it into a fluffy pile at the front of the machine. Refuse and sand contamination are eliminated through the chute shown at the side of the hopper in the accompanying illustration.



The Reciprocating Motion of the Screen Breaks and Aerates the Sand and Drops it Into the Hopper Below

Book Review

1931 *Supplement to Book of A. S. T. M. Standards*, paper, 144 pages, 6 x 9 inches, published by the American Society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $1.50 plus 15 cents postage, and in London by the Penton Publishing Co. Ltd., 416 Caxton House, Westminster.

During the interim between publications of the *Book of Standards* of the American Society for Testing Materials, which is issued every three years, yearly supplements are published which contain standards adopted or revised by the society during that year. The present issue contains 32 standards of which 17 are new ones, and 15 are replacements of existing standards. Seven of the standards relate to metals and 25 deal with nonmetallic materials.

Of the seven relating to metals, three deal with ferrous materials namely, alloy steel bolting materials for high temperature service; welded wrought iron pipe; and high test gray iron castings. The other four cover aluminum alloy (duralumin) sheet; aluminum-manganese alloy sheet; aluminum base sand casting alloys in ingot form, and aluminum base sand castings.

Operates Tote Truck With Jack Tongue

The Howe Chain Co., Muskegon, Mich., recently has made changes in the design of its line of tote trucks which has been marketed for a number of years. The truck is a simply designed unit adapted for use as a hand truck or trailer, and for the temporary storage of materials. A body of hardwood or steel, suitably shaped for the product to be handled, is attached permanently to two rear wheels, with a malleable iron leg supporting the front. This represents the storage unit, immovable and self-contained.

The Unit Is Designed for Many Applications as a Hand Truck or Trailer

For use as a hand truck, a jack tongue is inserted in the draw bar, and a simple downward movement of the handle exerts a cam action, and elevates the front leg 1¼-inch from the floor, transferring the load to the jack tongue wheel. The truck can then be pulled over rough floors, door sills, or soft foundry floors, and accurately spotted in its new location. The improved roller bearing wheels aid materially in moving the truck or a train of trucks.

To couple the trucks in a tractor train, the truck is brought into position, the jack tongue removed, a trailer hitch inserted in its place, and coupled to the clevis of the preceding truck. The three wheel construction is said to provide accurate tracking, and permits short turns, and the negotiation of narrow pathways. Tractor trains of 23 trucks have been found practical by some users. The trucks also may be co-ordinated with overhead monorail systems, and portable stackers.

Designs Space Heater

A space heater with the heating element of a nickel chromium alloy recently has been introduced by Cutler-Hammer Inc., 244 North Twelfth street, Milwaukee. A highly refractory granular compound is used for insulation. It is claimed that a new process of imbedding the element in the compound under immense pressure makes the space heater immune to vibration and jarring.

The heaters have a normal rated capacity of 500 watts and are supplied for 100-125 and 200-250 volts, either direct or alternating current. They have a high overload capacity to care for unusual voltage peaks. A descriptive pamphlet on the new space heater recently has been prepared by the company.

C. F. Herington during the last nine years has been affiliated with Heyl & Patterson Inc., Pittsburgh, has become connected with the Pulverizing & Combustion Equipment division, Whiting Corp., Harvey, Ill., as sales engineer. Mr. Herington is well known in the combustion field, having had 28 years experience in engineering work, including 6 years with Westinghouse, Church Kerr & Co., 7 years with the New York Central and Pennsylvania railroad, and 15 years in selling pulverized coal plants.

Compressor Operates at High Pressure

Quincy Compressor Co., Quincy, Ill., recently introduced a large automatic, air-cooled, two stage compressor unit with an 80-gallon tank, which is designed especialy for various uses where high pressures are desired. The unit has a displacement of 21.6 cubic feet per minute and is recommended for pressures of 200 pounds for continuous service and 350 pounds for intermittent service.

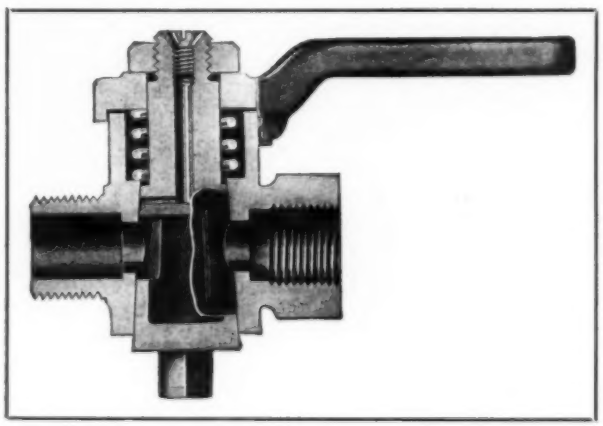
The main bearings of the unit are equipped with tapered roller bearings and the entire mechanism is lubricated by a gear type oil pump supplying oil under pressure to the connecting rod bearings and the piston pin bushings Valves are of the ring plate type, automatically operated, and are designed to function with low lifts to provide quietness and long life. All valve assembly parts are made from a special grade of alloy steel and each assembly is contained in a special valve pocket to provide for inspection. The compressor is cooled by a large fan type fly wheel which directs a large volume of air over the entire heat radiating area. The finned areas of the head and cylinder castings have a total effective heat radiating surface of 681 square inches. Automatic pressure control is provided with a special suction valve unloading mechanism which permits the motor to start the compressor without load. The unit is equipped for belt drive.

The Compressor Is Cooled by a Large Fan Type Fly Wheel

Automatic Lubrication Features Air Cock

The Haydenville Co., Haydenville, Mass., recently developed an air cock with a constant automatic and positive system of lubrication within the cock to eliminate freezing and sticking. An oil pocket is located in the spindle with outlets so arranged that each time the cock is operated enough lubricant is passed into the two oil grooves inside of the body.

Stop plugs on the body limit the handle to a quarter turn, preventing to a degree the scoring of body or spindle by any foreign matter. The tension spring, an important feature of the design, is made of a special grade of phosphor bronze and designed to maintain a constant and even tension between the key and body at all times. Handles are of malleable iron. The cocks are made in sizes ranging from ⅜-inch to 3 inches. A sectional view is shown in the accompanying illustration.



Automatic Lubrication Is Provided Through an Oil Pocket Located in the Spindle

Has Variable Speed

Hammond Machinery Builders, Kalamazoo, Mich., has developed a variable speed pulley for use with polishing, buffing and grinding machines built by the company. The pulley is capable of transmitting up to 15 horsepower capacity. It has a ratio of 1 1/3 to 1, which makes it possible to give a large number of speeds at that ratio. A feature of the new variable speed pulley is that it can be used with the V-belt, and takes little additional room than the ordinary V-belt pulley. For grinders using 24-inch wheels, a speed range of 1600 to 2400 revolutions per minute is supplied, maintaining a 9500 surface feet per minute speed on the wheel until it is worn to a diameter of 13 inches.

Develops Metal Solder

The Allied Research Laboratories, Glendale, Calif., recently has developed a solder claimed to repair aluminum, pot metal, die castings, cast iron and steel. It is similar in color to aluminum, and has a tensile strength of 12,000 pounds per square inch. It is claimed that the solder breaks down the structure of the metal being repaired, and fuses with it to form a single piece. The solder is applied with an ordinary soldering iron or blow torch, and requires a temperature from 50 to 250 degrees higher to remelt it after being once applied. The solder is said to withstand heat, and steam and water pressures. It is ductile and the manufacturer claims that it will take a polish over which chromium or other plating may be applied.

Steel Wear Resistance

In a recent publication of the bureau of standards, Washington, entitled "The Wear Resistance of Carbon Steels," by S. J. Rosenberg, it was pointed out that under combined rolling and sliding friction under heavy pressures that a steel with a martensitic-troostitic matrix was most resistant. Steels containing lamellar pearlite showed excellent wear resistance while steels containing granular pearlite had poor resistance. The publication is research paper No. 348, and it may be obtained from the superintendent of documents, Washington, for 10 cents.

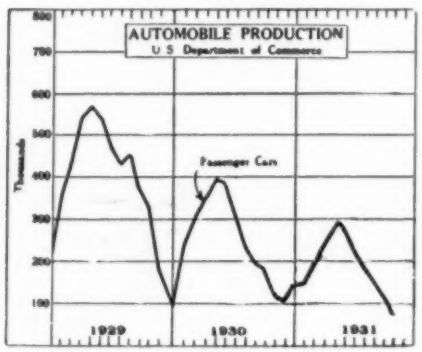
A bulletin entitled "Mineral Resources of the United States, 1930," recently has been published by the bureau of mines, Washington. It contains information on the production, imports and exports of the various mineral and nonmineral products of this country in summarized tables. Copies may be obtained from the superintendent of documents, Washington, for 20 cents.

What the Foundries Are Doing

Reflecting the Activities of Gray Iron, Malleable, Steel and Brass Shops

Frank Foundries Corp., Davenport, Iowa, will build a 1-story addition, 50 x 91 feet, at 1739 West Second street, for a pattern shop and storage.

Name of the Marchant's Foundry Co., 4401 East Tenth street, Oakland, Calif., has been changed to the Vulcan Foundry Co. R. C. Hoyt is president, E. S. Hoyt vice president and H. L. Martin secretary.



Tweed Foundries Ltd., Tweed, Ont., has been incorporated with $40,000 capital to operate a foundry, by Wilberforce Gordon, Tweed, Ont.

Groner Co., 235 Broad street, Phillipsburg, N. J., has been taken over by Tippett & Ward, 162 Howard street, Phillipsburgh. The plant has been closed but may be opened later.

Jenkins Bros., Lachine, Que., practically have completed equipping first unit of new foundry and have plans for two other units to follow, at a cost of $2,000,000.

New Athens Mfg. Co., New Athens, Ill., has been incorporated with 100 shares no par value to manufacture stoves, ranges and castings, by John F. Nagel, Benjamin F. Schulein and associates, New Athens.

Fischer Foundry Corp., Bound Brook N. J., recently has acquired the business of he Fischer-Sweeney Bronze & Aluminum Co. Inc., Bound Brook. Future operations will be consolidated at the plant of the Fischer Foundry Corp., Lincoln boulevard, Bound Brook. W. F. Jennings is president of the new company.

Foundry operating schedules in the Chicago-Milwaukee area at mid-December had slumped slightly from activity at the beginning of the month. Schedules were 22 to 25 per cent. Several of the aluminum shops had good orders, chiefly from the kitchen utensil industry. Railroad shops had been spreading out more work and showed increased activity.

The Valley Castings & Pattern Co., Bay City, Mich., reports that it has developed a method for manufacturing pure copper castings containing copper tubing inserts. The castings are for use in welding machines and transformer secondary castings which must be water cooled. The firm claims that use of copper tubing inserts does not affect the conductivity of the castings as does use of steel tubing.

Trade Publications

MOTORS—Wagner Electric Co., 6400 Plymouth avenue, St. Louis, has issued its bulletin No. 167 describing in detail its line of small motors.

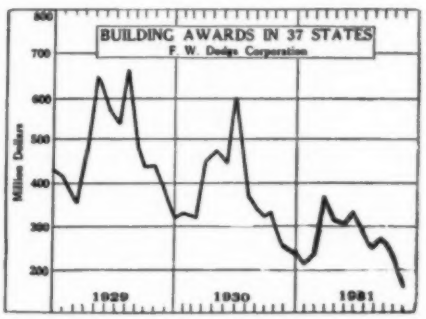
MECHANICAL STOKERS—A condensed catalog of mechanical stokers has recently been issued by the Stoker Manufacturers association, W. V. McAllister, secretary, Walker street, Detroit.

PRESSES—Hydraulic Press Manufacturing Co., Mount Gilead, O., has issued a catalog describing its line of hydraulic presses. Included in the products are presses for compressing loose material such as scrap metal, etc.

RECORDING INSTRUMENTS—General Electric Co., Schenectady, N. Y., has issued a bulletin No. 1061D describing and illustrating its line of recording instruments for alternating and direct current use.

SANDBLAST NOZZLE—A. E. Wood Co., 1514 East Nadeau street, Los Angeles, has issued a folder describing its sandblast nozzle. Features of the design of this nozzle are its length and its "No-Coupling" feature. The nozzle is 7 inches long.

CAPACITORS — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has published a leaflet No. 2004-F covering a group type capacitor equipment for power factor correction on 60 cycle circuits. The equipment is designed to meet the need for correcting equipment for loads smaller than synchronous condensers will handle economically and in locations where losses are important.



DRIVES—E. F. Houghton & Co., Philadelphia, has issued a 150-page catalog of specifications for its short center drives. Extensive tables give recommendations for belt widths, pulley diameters, proper center distances for drives of various speeds and horsepowers.

ELECTRIC FURNACES— W. S. Rockwell Co., 50 Church street, New York, has issued a bulletin No. 320 illustrating its line of electric and fuel furnaces for ferrous and nonferrous metals, ceramic and chemical products. Both annealing and melting furnaces are included.

COMPRESSORS—Vertical air compressors are described and illustrated in bulletins No. 88-B and 88-C recently published by the Sullivan Machinery Co., 50 Church street, New York. General features of design and operation and considerable technical data are included.

CEMENT—Chas. Taylor Sons Co., 706 Burns street, Cincinnati, has issued a bulletin describing an air setting cement for furnace construction and repairs. Features claimed for this cement are high refractoriness, ample bonding strength, low shrinkage and resistance to slagging. The cement is sold under the name of P. B. Sillimanite.

DRIVES—Westinghouse Electric Mfg. Co., East Pittsburgh, Pa., has published a bulletin on its multi-speed drive, consisting of an adjustable speed reducer built into a standard reduction motor. It is pointed out that speed changes can be made with the motor running under load. Standard sizes range from ½ to 15 horsepower.

WOODWORKING MACHINERY — Oliver Machinery Co., Grand Rapids, Mich., has prepared a bulletin describing its new pattern router and borer, which is designed for special requirements of pattern shops. Information includes details of construction and brief facts on the type of work to be performed on the machines.

RAW MATERIAL PRICES

Dec. 22, 1931

Iron	
No. 2, foundry, Valley	$15.50 to 16.00
No. 2 Southern, Birmingham	12.00
No. 2 foundry, Chicago	16.50
No. 2 foundry, Buffalo	17.00
Basic, Valley	15.00
Basic, Buffalo	16.50 to 17.00
Malleable, Chicago	16.50
Malleable, Buffalo	17.50
Coke	
Connellsville Beehive coke	$3.25 to 4.50
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$9.00 to 9.50
Heavy melting steel, Pitts.	10.00 to 10.25
Heavy melting steel, Chicago	7.50 to 8.00
Stove plate, Buffalo	8.25 to 8.75
Stove plate, Chicago	6.75 to 7.25
No. 1 cast, New York	7.00 to 7.50
No. 1 cast, Chicago	8.00 to 8.50
No. 1 cast, Philadelphia	11.50
No. 1 cast, Pittsburgh	10.00 to 10.50
No. 1 cast, Birmingham	9.00 to 10.00
Car wheels, iron, Pittsburgh	10.00 to 10.50
Car wheels, iron, Chicago	8.50 to 9.00
Railroad malleable, Chicago	7.00 to 7.50
Agricultural mal., Chicago	7.00 to 7.50
Malleable, Buffalo	9.75 to 10.25
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	7.00
Straits tin	22.00
Aluminum, No. 12, producers	22.00
Aluminum, No. 12 remelt	8.50 to 9.50
Lead, New York	3.75
Antimony, New York	6.25
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.15